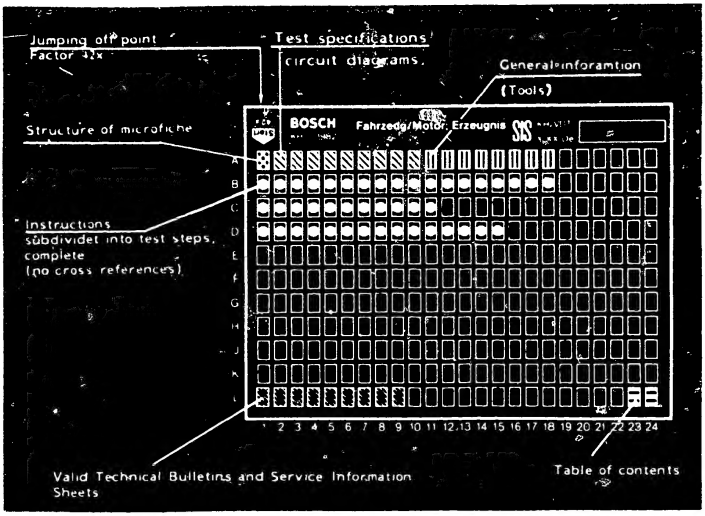
Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

C6

1. Test specifications - electrical

B2

Suppression capacitor 1.8...2.6µF

Regulated voltage Load current ≤ 10A

Regulator part number	Regulated voltage (V)
0 192 033 001	27.2...28.2
0 192 033 002	27.5...28.5
0 192 033 003	27.5...28.5
0 192 033 004	27.4...28.4
0 192 033 005	27.4...28.4
0 192 053 001	27.6...28.4
0 192 053 002	27.6...28.4
0 192 053 004	27.6...28.4
0 192 053 005	27.6...28.4
0 192 053 006	27.6...28.4
0 192 053 007	27.6...28.4
0 192 053 008	27.6...28.4
0 192 083 001	27.4...28.4
0 192 083 002	27.4...28.4
0 192 083 003	27.4...28.4

Power test

Resistances - stator

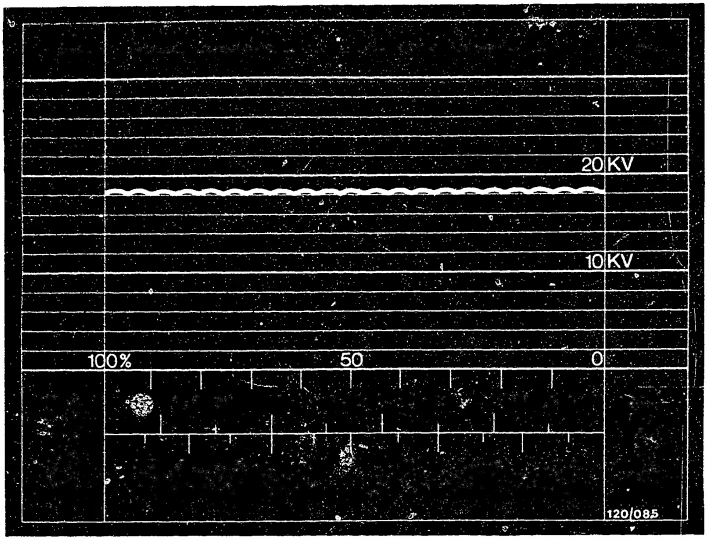
Resistances - rotor

D5
B8
B14

For power test with regulator set 26 V on test bench.

Alternators 0 120 400.. 0 120 489..	Power test Speed 1) min^{-1}	Load A	Resistances Stator Ω + 10%	Rotor Ω + 10%
K1(RL)28V17A19	1200	5	0.8	19.5
	2000	12		
	6000	17		
K1(RL)28V18A21	1500	5	0.4	20.0
	2100	12		
	6000	18		
K1 (RL)28V21A21	1200	5	0.8	8.7
	2100	14		
	6000	21		
K1(RL)28V25A19	1050	5	0.8	9.0
	1900	16		
	5000	25		
K1(RL)28V27A23	1350	5	0.4	8.7
	2300	18		
	6000	27		
K1(RL)28V35A24	1300	5	0.4	9.0
	2400	23		
	6000	35		
K1(RL)28V45A27	1750	10	0.22	9.0
	2750	30		
	6000	45		

1) Warmed-up alternator (60°C) with regulator



Oscilloscope display OK

If the alternator is OK, the above oscilloscope pattern will be displayed. The DC output has a slight ripple. The pattern can exhibit small peaks when the voltage regulator comes into operation. The regulator can be stopped by means of switching in loads (e.g. load resistor).
Adjust the pattern height so that the ripple is contained between two adjacent kV lines.
In order to be able to compare such patterns, the pattern concerned is to be adjusted with the vertical control of the oscilloscope so that it fits approximately between the 10 kV and 20 kV lines.
Note: more than one defect can be present at one time.

2. Test specifications - mechanical

True-running error

O.D. of rotor 0.05 mm
O.D. of collector rings 0.03 mm

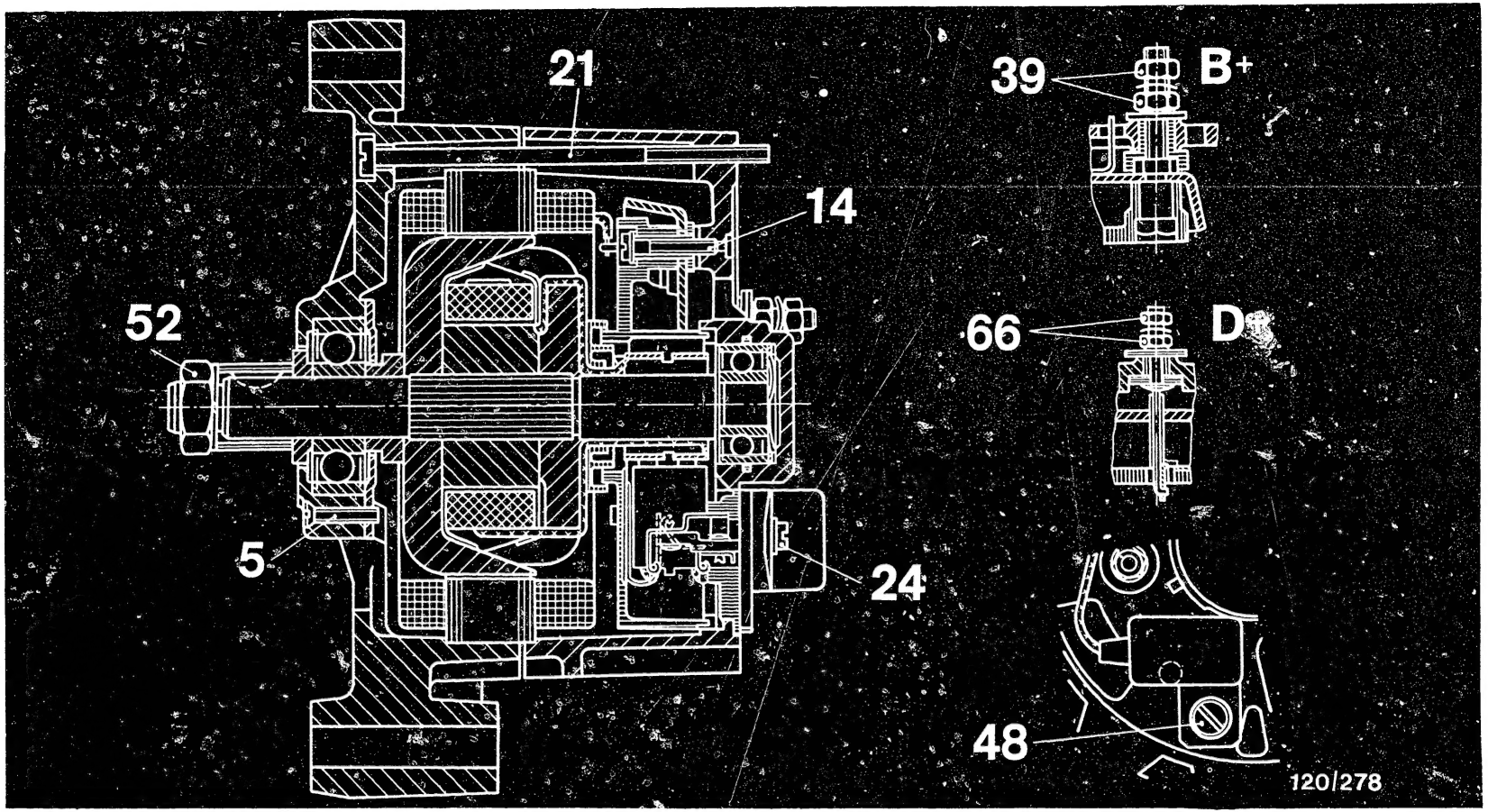
B16

Minimum diameter of collector rings
(see table)

Minimum projection of carbon brushes
(see table)

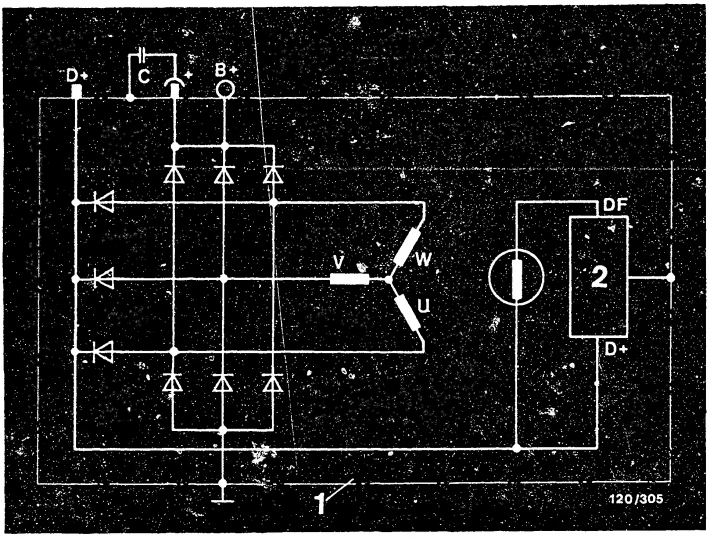
B4

Alternators	Collector ring dia. (mm)		Brush projection (mm)	
	New	Min.dia.	New	Min.
0 120 400..)	27.8	26.8	14	5.0
0 120 489..)	32.5	31.5	10	5.0



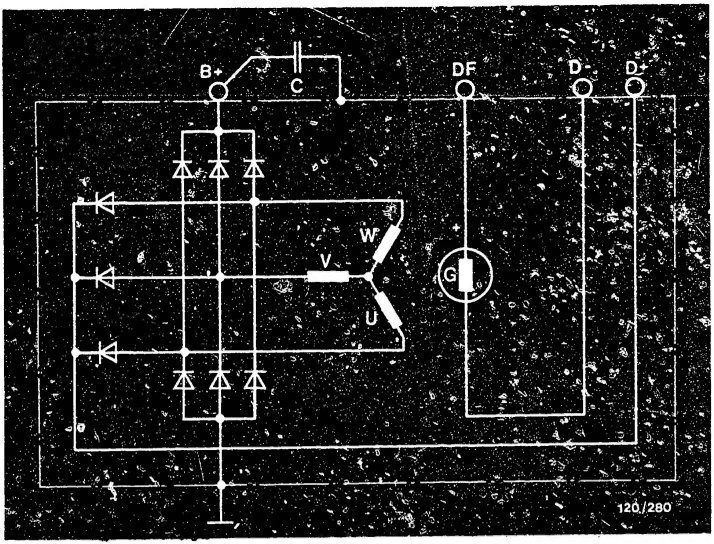
Tightening torques

Item 5 = 2.4 ... 3.5 Nm		Item 39 = 4.8 ... 6.8 Nm	(B+)
Item 14 = 1.4 ... 2.0 Nm		Item 48 = 2.9 ... 4.1 Nm	(suppression capacitor)
Item 21 = 4.1 ... 5.5 Nm		Item 52 = 35 ... 45 Nm	
Item 24 = 1.6 ... 2.3 Nm		Item 66 = 1.6 ... 2.3 Nm	(D+)



3. Circuit diagram of alternator K1 - 28V ≦ 45A

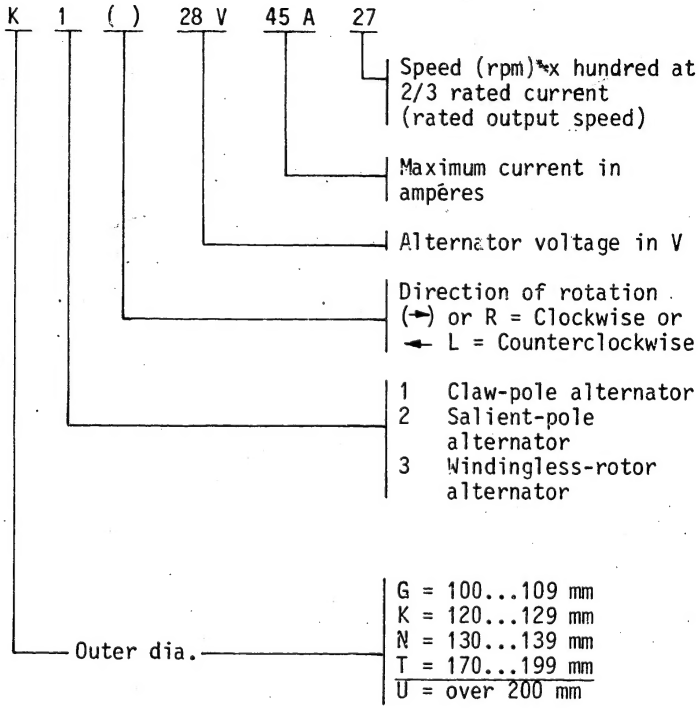
1 = Alternator
2 = Regulator



Circuit diagram of K1 alternator with separately-mounted regulator
0 120 400.., up to 45A

4. General Instructions

Explanation of type code on alternator



Cleaning the parts

C A U T I O N ! F I R E H A Z A R D !

Alternators are being increasingly fitted with long-storage capacitors (e.g. for the interference suppression of receivers and transmitters).

When washing parts of the alternator it is possible for the capacitor to discharge when immersed in cleaning fluids, there then being the danger that inflammable liquids will ignite. For this reason, parts with capacitors must only be washed in tri- or perchloroethylene.

Note:

The alternator 0120469727 was used for drawing up these Repair Instructions. Details on the various models of alternator can be taken from the appropriate Service Part Microfiches.

5. Test equipment and tools and adhesives

5.1 Test equipment

Alternator test bench	EFLI 91	0 683 300 100
	or EFLJ 25 ..	0 680 110 ...
	or EFLJ 70 A	0 680 104 ...
or combination test bench (only for loading up to max. 43 A)	EFAW 275 ..	0 681 107 ...
Mounting plate for mounting swivel-arm-mounted alternators on alternator test bench	EFLJ 66/3 EFLJ 25, 70	
Parts set for mounting swivel-arm-mounted alternators on combination test bench	EFAW 275 ..	1 687 000 042

For additional test:

Ignition oscilloscope (all models)

or

Bosch Motortester (all models)

Test equipment (continued)

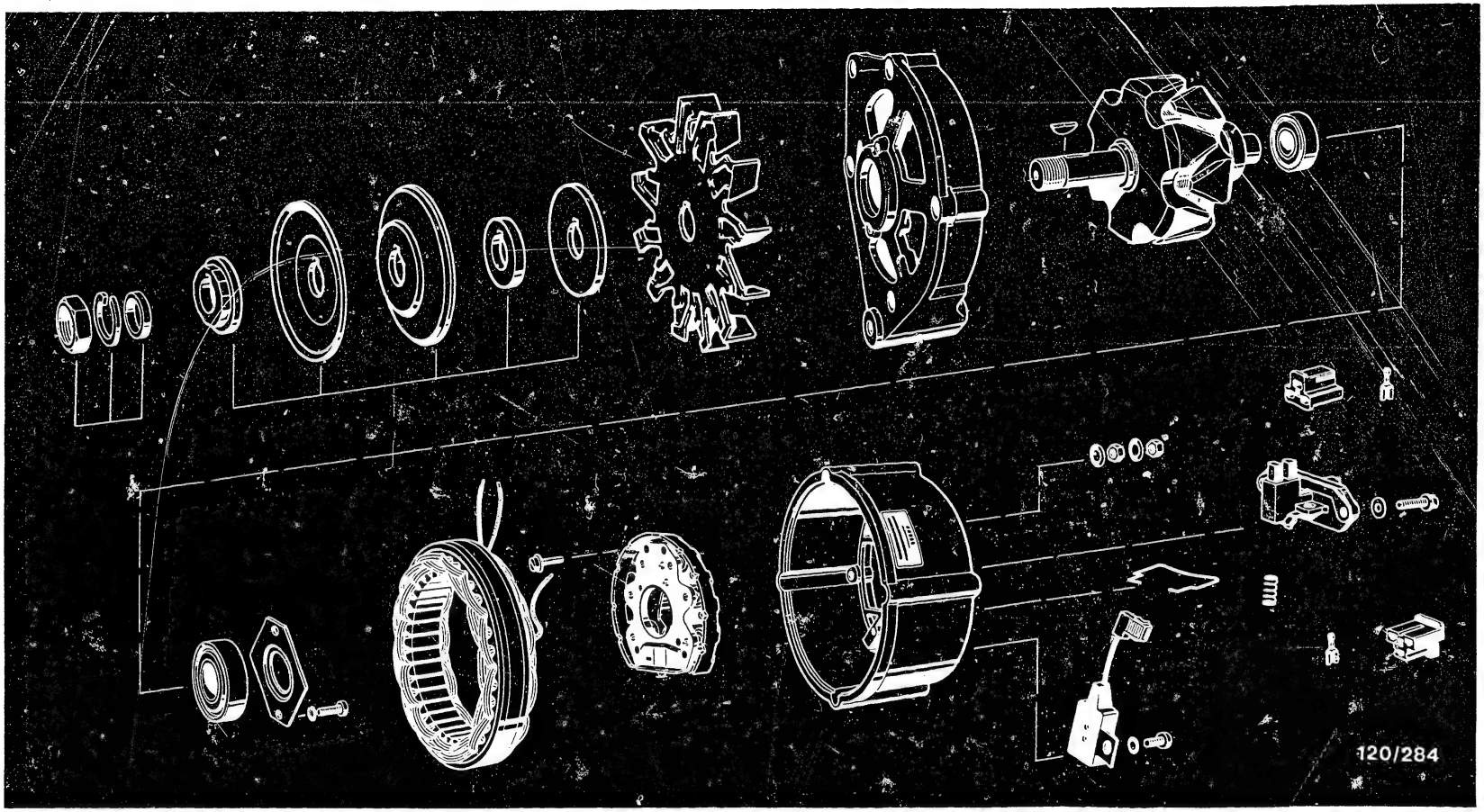
Test panel	KDAW 9984	
formerly	EFAW 81	0 681 169 013
Transformer panel	KDAW 9985	
formerly	EFAW 82	0 681 169 014
Insulation tester	KDAW 9983	
formerly	EFAW 84	(Included with KDAW 9984)
Dial indicator	EFAW 7	1 687 233 011
Magnetic instrument stand	T-M1 (EW/MS 1 B 1	4 851 601 124 0 601 980 001)
Alternator tester	EFAW 192	0 681 101 403
	or	
	WPG 012.00	0 684 201 200
3 Feeler gauges 0.15 ... 0.6 mm	KDZV 7399	
Electric tester	ETE 014.00	0 684 101 400

5.2 Tools

Press-on mandrel	KDLI 6002
Press-on mandrel for collector rings	KDLI 6004/1 and KDLI 6004/0/3
Holding device for pulley	KDLI 6006
Clamping pin for arbor press	KDLI 6010
Press-on mandrel for collector-ring end shield	KDLI 6499/0/3
Clamping support	KDAW 9999
Arbor press	(commercially available)
Two V-blocks	(commercially available)
Soldering iron 180 W	(commercially available)
Collector-ring puller	(commercially available)
Press-out ring, e.g. old stator frame from starting motor, inner diameter: 105 mm outer diameter: 115 mm	

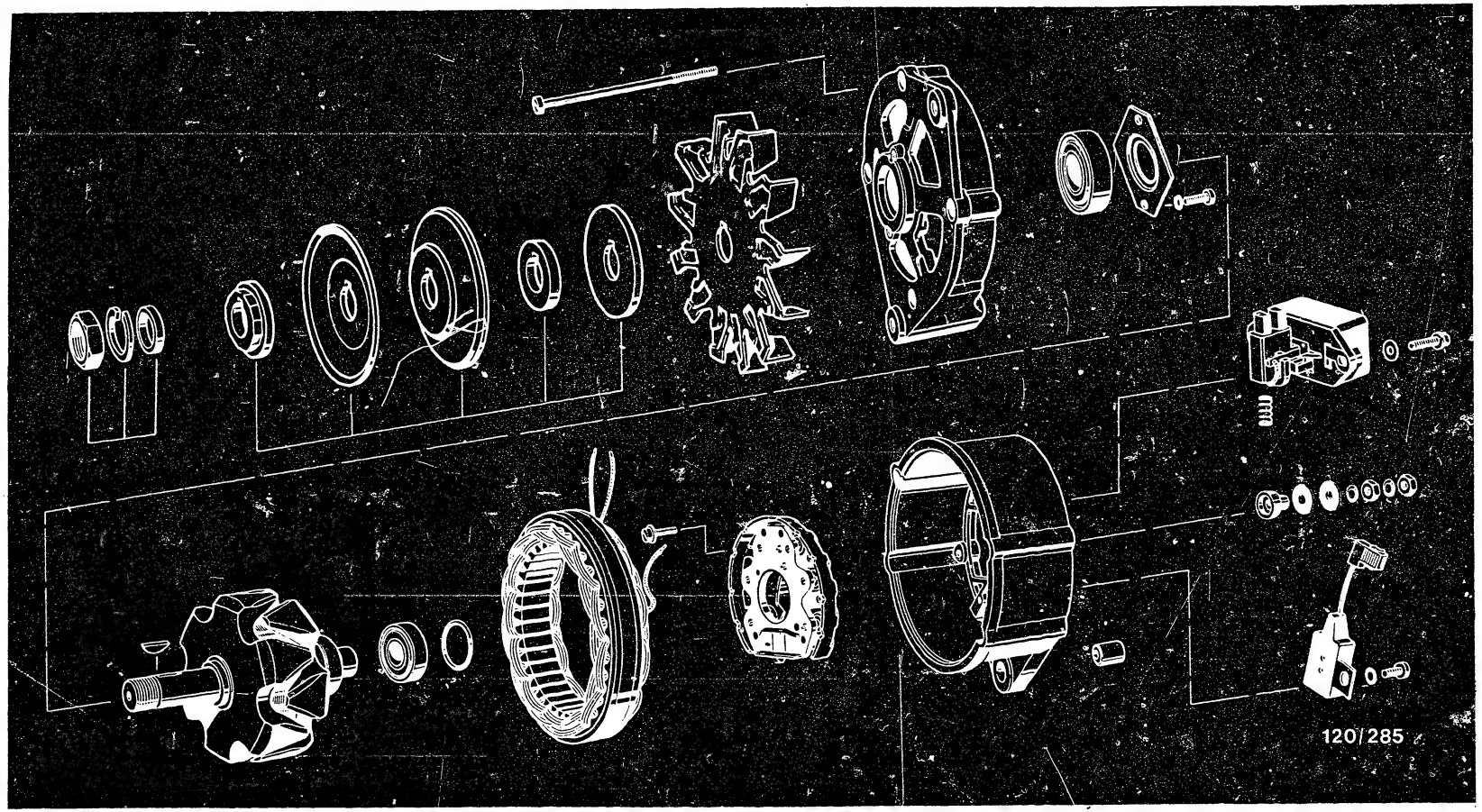
5.3 Adhesives

Dispersion binder KK57v1	5 703 151 000



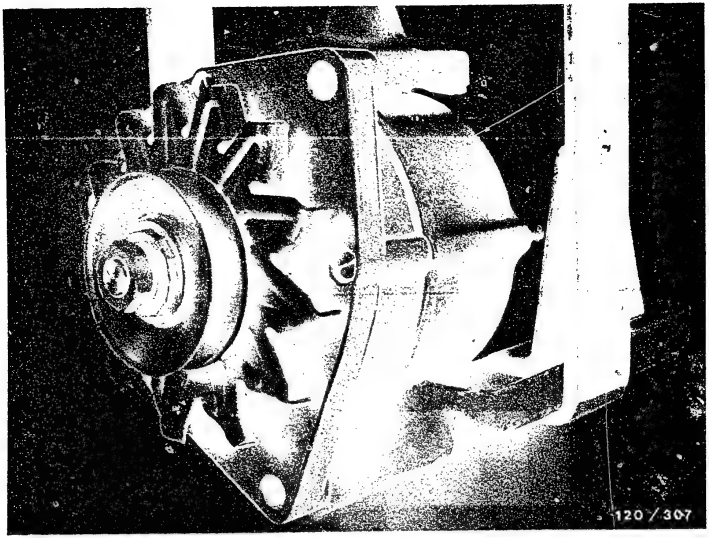
6. Exploded view

K1 alternator 0 120 400 ...



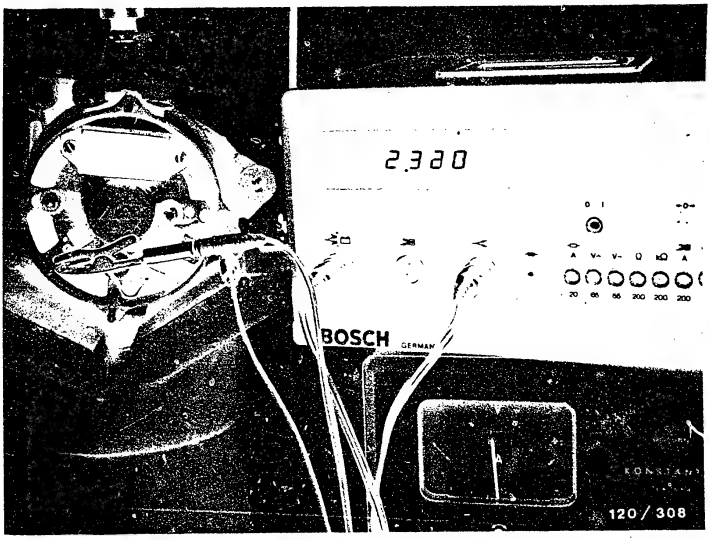
6.1 Exploded view

K 1 alternator 0 120 489 ...



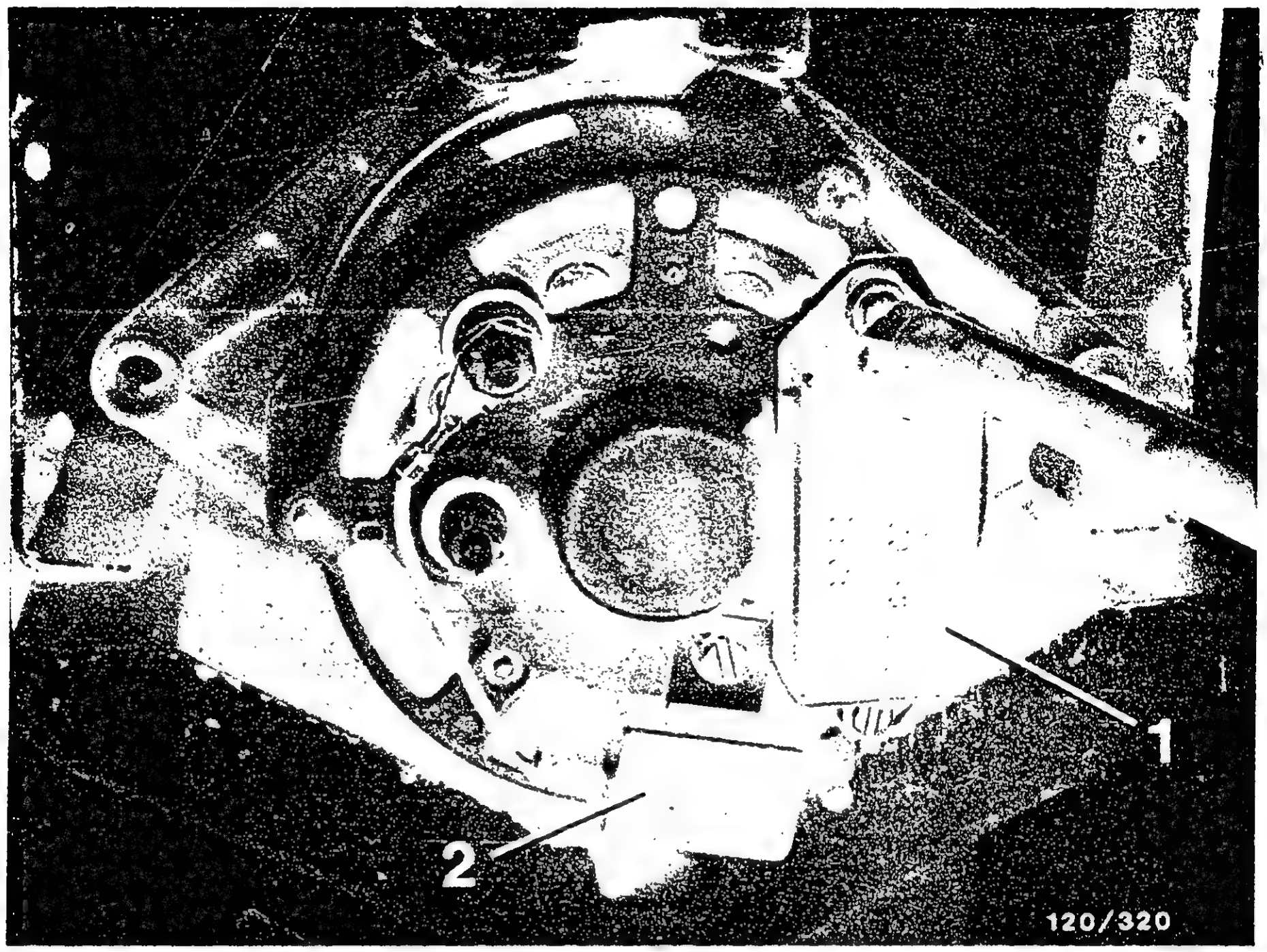
7. Dismantling the alternator and testing the parts

Clamp the alternator in clamping support KDAW 9999.



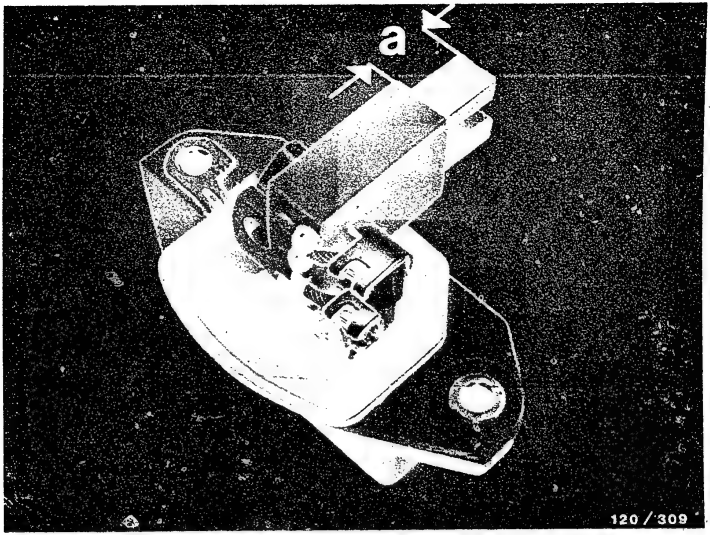
7.1 Testing the suppression capacitor

Remove lead of suppression capacitor from terminal B+. Connect electric tester between lead of suppression capacitor and terminal B- of alternator (picture). Set value: 1.8 ... 2.6 µF.
If this value is not reached, replace the defective suppression capacitor. After testing, discharge the suppression capacitor by short-circuiting so that there is no possibility of the cleaning liquid igniting when the parts are cleaned.



1 = Electronic regulator with carbon-brush holder
2 = Capacitor

Caution!
Before further dismantling the alternator, first of all remove the electronic regulator.
To do this, unscrew the 2 fastening screws on the regulator.
If this sequence of operations is not followed, the carbon brushes will break when the alternator is pulled apart.

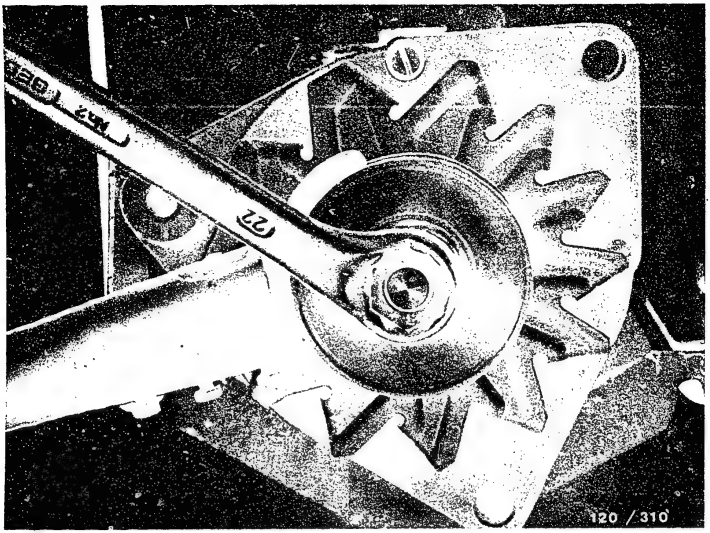


7.2 Testing the regulator for external damage and replacing the carbon brushes

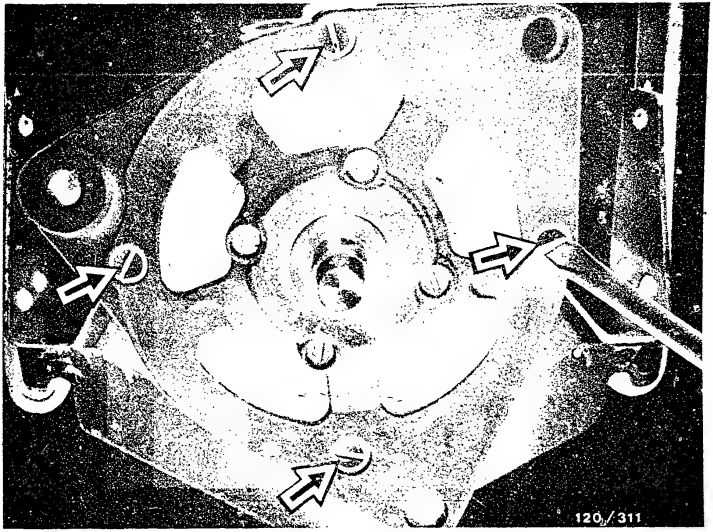
If carbon brushes are broken off, or if the projection dimension "a" is less than 7 mm, replace the carbon brushes.
Observe dimension "a" when soldering in the new carbon brushes.

Alternators	Collector ring dia. (mm)		Brush projection (mm)	
	new	min. dia.	new	min.
0 120 400..)	27.8	26.8	14	5.0
0 120 489..)	32.5	31.5	10	5.0

Note: Solder (colophonium tin only) must not flow into copper strand.
Check the carbon brushes for freedom of movement after installing.

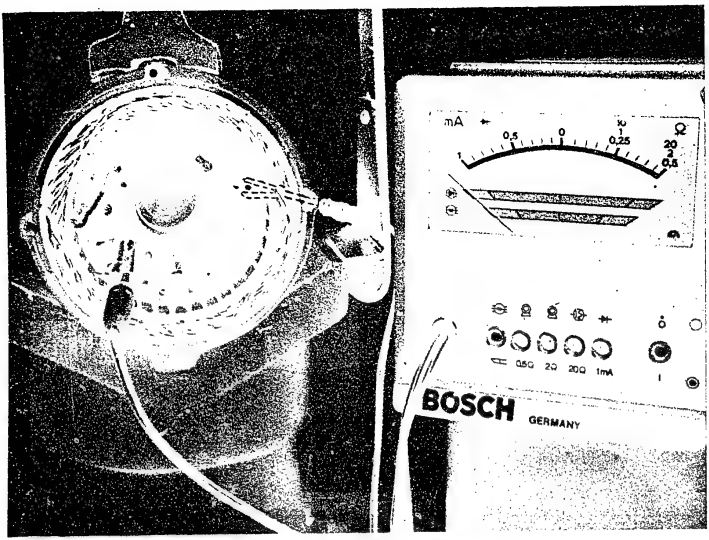


Using holding tool KDLI 6006 and 22 mm open-end wrench, loosen fastening nut and remove pulley with fan.



Caution

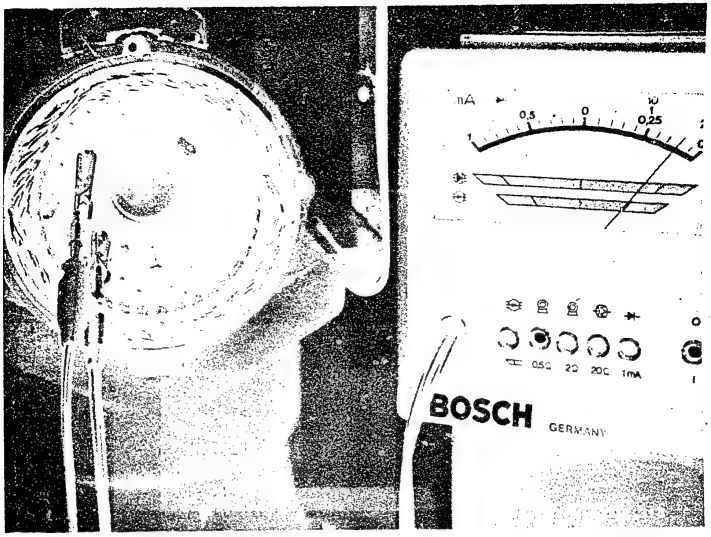
Before the alternator is further dismantled, mark the drive end shield, collector-ring end shield and stator so that these parts are brought into the same position again when assembling.
Loosen four fillister-head screws (arrows) and remove. Withdraw drive end shield with rotor from collector-ring end shield.



7.3 Testing the rectifier

Test the proper operation of the rectifier unit when connected up using EFAW 192 or WPG 012.00. Capacitor not connected. Note switch position on tester.
Test points:
Housing and winding ends
B+ and winding ends
D+ and winding ends
Rectifier is OK if the pointer of the tester is in the green area when testing.

If one or more diodes are defective, replace the complete rectifier unit.



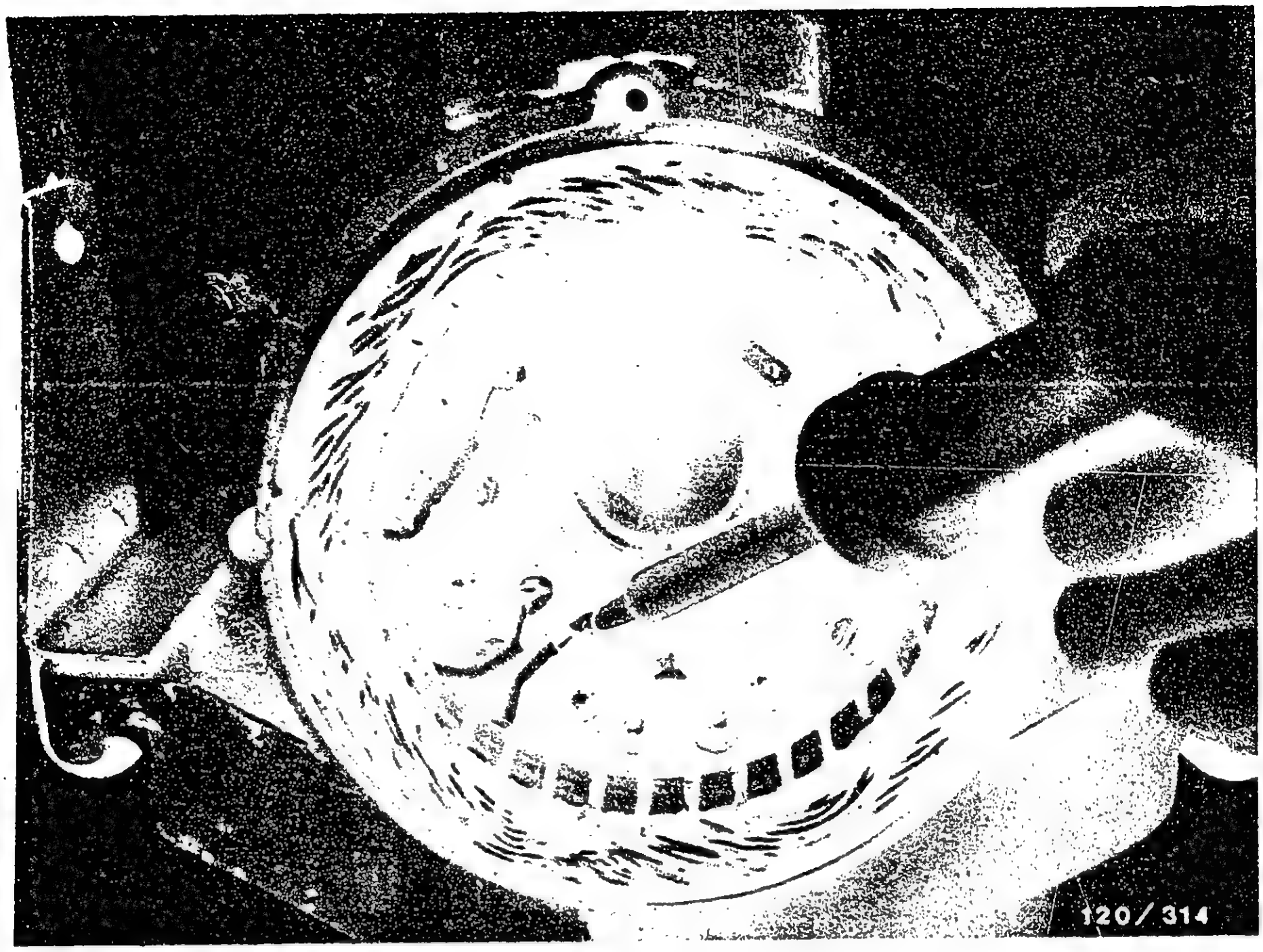
7.4 Testing the stator (resistance)

With the stator installed, test its resistance (picture).
Note switch position on tester.

Resistance [2]) with alternators:

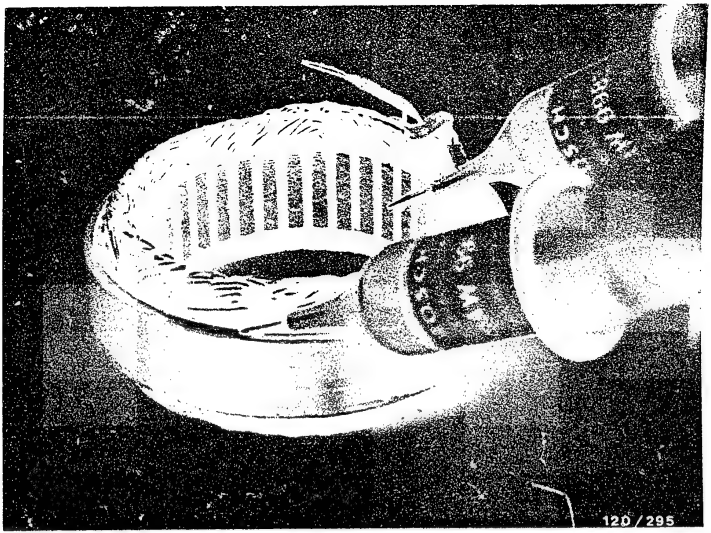
K1(RL)28V17A19	0.8	Ω	+ 10%
K1(RL)28V18A21	0.4	Ω	+ 10%
K1(RL)28V21A21	0.8	Ω	+ 10%
K1(RL)28V25A19	0.8	Ω	+ 10%
K1(RL)28V27A23	0.4	Ω	+ 10%
K1(RL)28V35A24	0.4	Ω	+ 10%
K1(RL)28V45A27	0.22	Ω	+ 10%

[2]) Between the phase outlets.



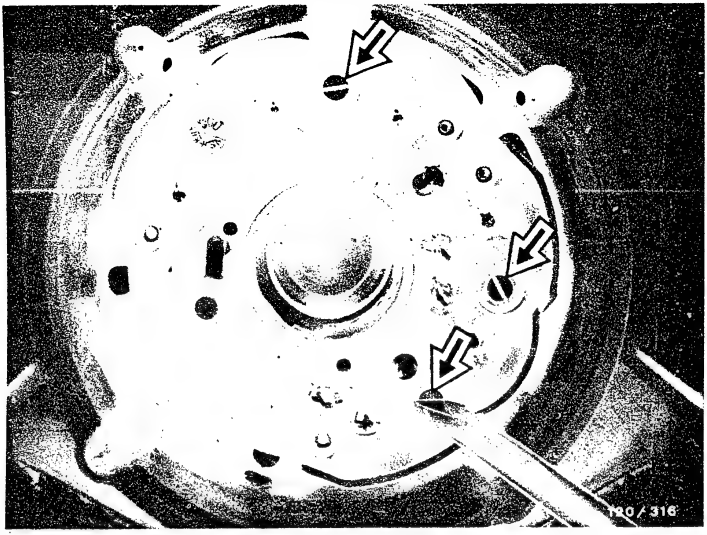
Removing the stator

Remove solder from the phase connections using soldering iron or soldering gun. Using a screwdriver, straighten the ends of the leads and pull the leads out of the fastening holes.



7.5 Testing the stator (short circuit to ground)

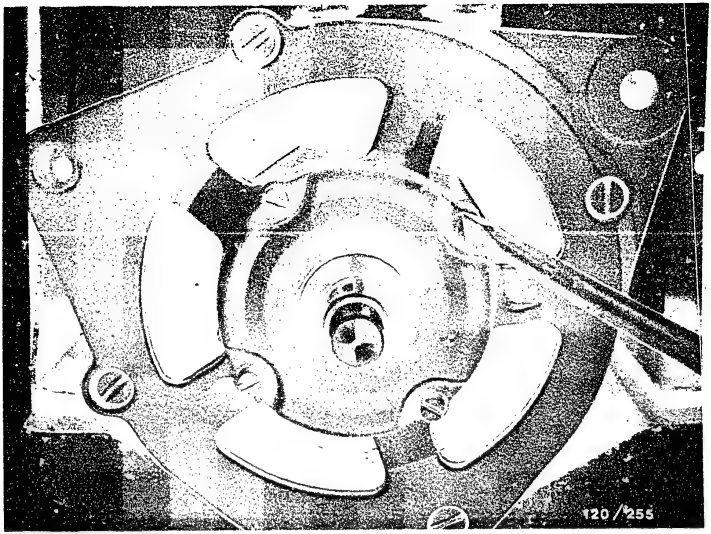
Test the stator for short circuit to ground using test prods EFAW 84 or KDAW 9983.
Test voltage: 80 V a.c.



Removing the rectifier

Remove 3 washer-and-screw assemblies on inside of rectifier unit (picture).
Loosen terminal studs B+, B- and D+ on outside of collector-ring end shield. They are rigidly mounted on the rectifier.
If fitted, loosen terminal W at this point!

Withdraw rectifier unit from collector-ring end shield.

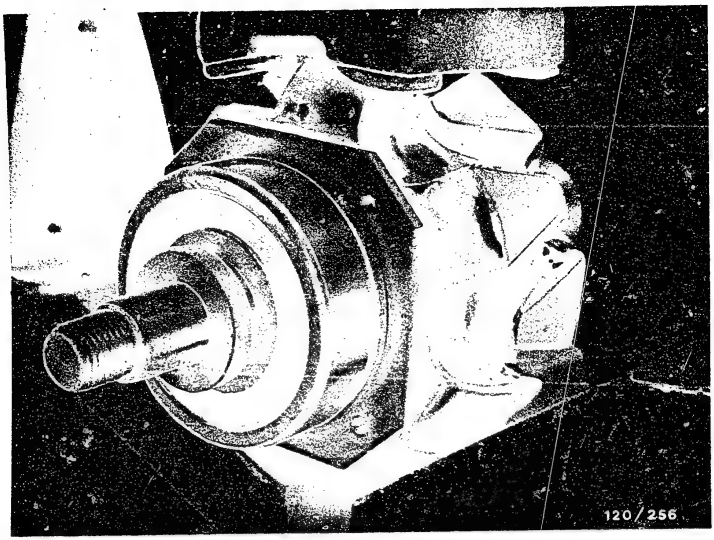


Remove claw-pole rotor

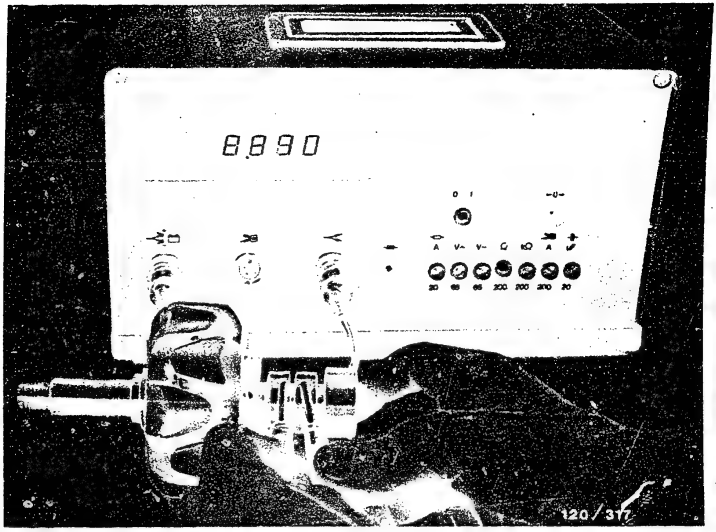
The claw-pole rotor only needs to be removed if the following parts are defective:

Collector rings, excitation winding or deep-groove ball bearing.

Release the four fastening screws and remove them (arrow), pull the deep-groove ball bearing, together with the rotor, (see Fig.) out of the end shield. (Press-in fit).



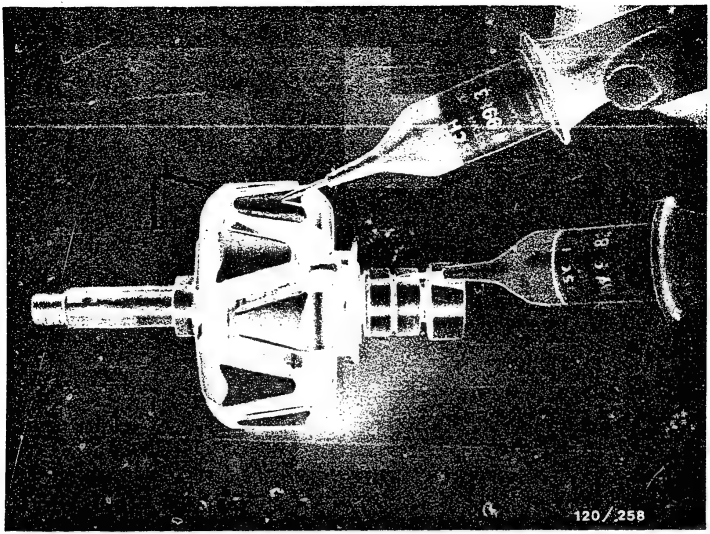
Clamp the claw-pole rotor in the clamping support. Using a commercially available puller, remove the deep-groove ball bearing with cover plate.



7.6 Testing the rotor resistance

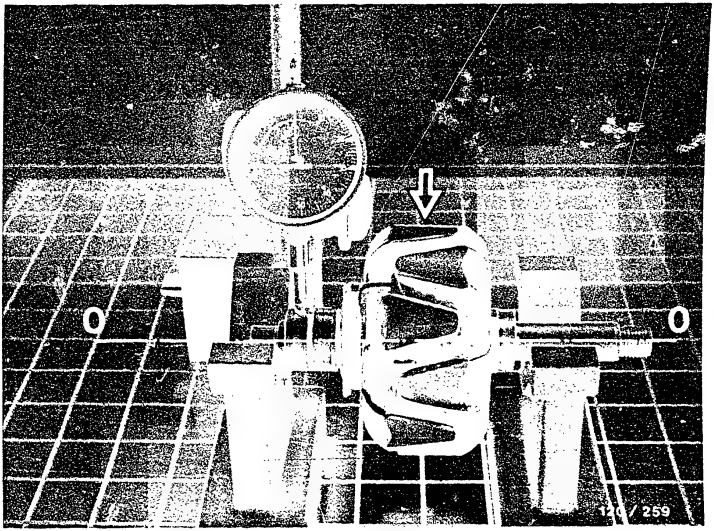
Measure the rotor resistance using electrics tester ETE 014.00 (picture).
Resistance value for alternator

K1(RL)28V17A19	19.5	Ω + 10%
K1(RL)28V18A21	20.0	Ω + 10%
K1(RL)28V21A21	8.7	Ω + 10%
K1(RL)28V25A19	9.0	Ω + 10%
K1(RL)28V27A23	8.7	Ω + 10%
K1(RL)28V35A24	9.0	Ω + 10%
K1(RL)28V45A27	9.0	Ω + 10%



7.7 Testing the rotor for short circuit to ground

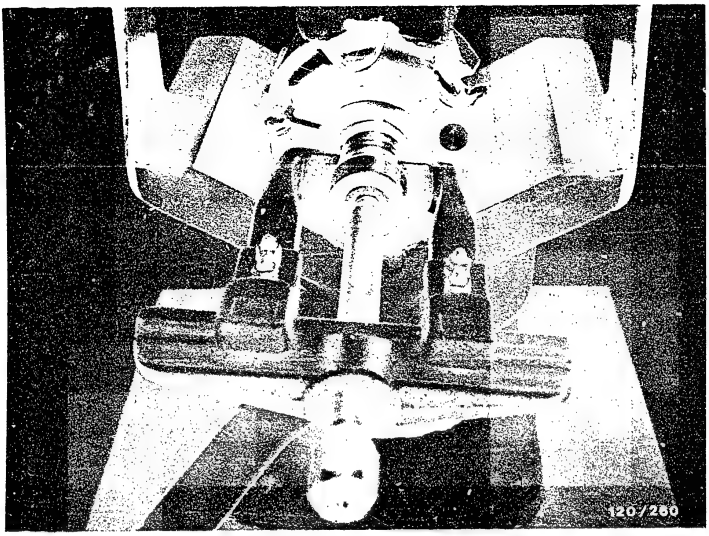
Using test prods EFAW 84 or KDAW 9983, test the rotor for short circuit to ground.
Test voltage 80 V a.c.



7.8 True-running test

Mount the journals of the rotor in the V-blocks and align exactly horizontal. Carry out true-running test on outside diameter of rotor (see arrow in Fig.) and on outside diameter of the collector rings using magnetic instrument stand T-M1 (4 851 601 124) and dial indicator EFAW 7.
Maximum error on rotor 0.05 mm.
Maximum error on collector rings 0.03 mm.
If error is greater, skim collector rings.
Minimum diameter of collector rings:

new dia.	dia. at least
27.8 mm	26.8 mm
32.5 mm	31.5 mm



Removing the collector rings

Pull off the deep-groove ball bearing using a commercially available puller (see picture).

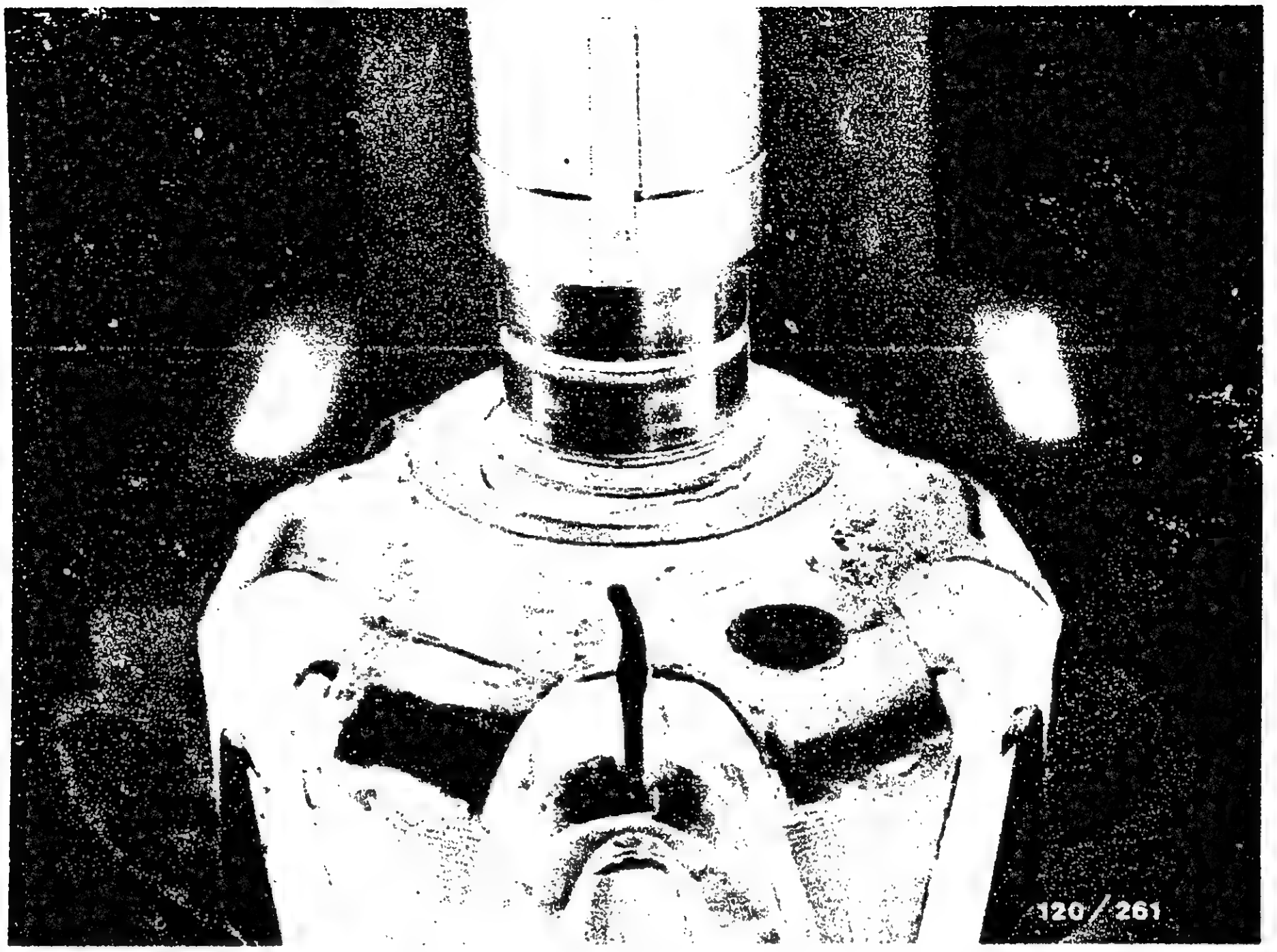
Unsolder the leads of the excitation winding from the collector rings. Pull the collector rings off the rotor shaft using a commercially available puller (not shown).

8. Cleaning the parts

CAUTION! FIRE HAZARD!

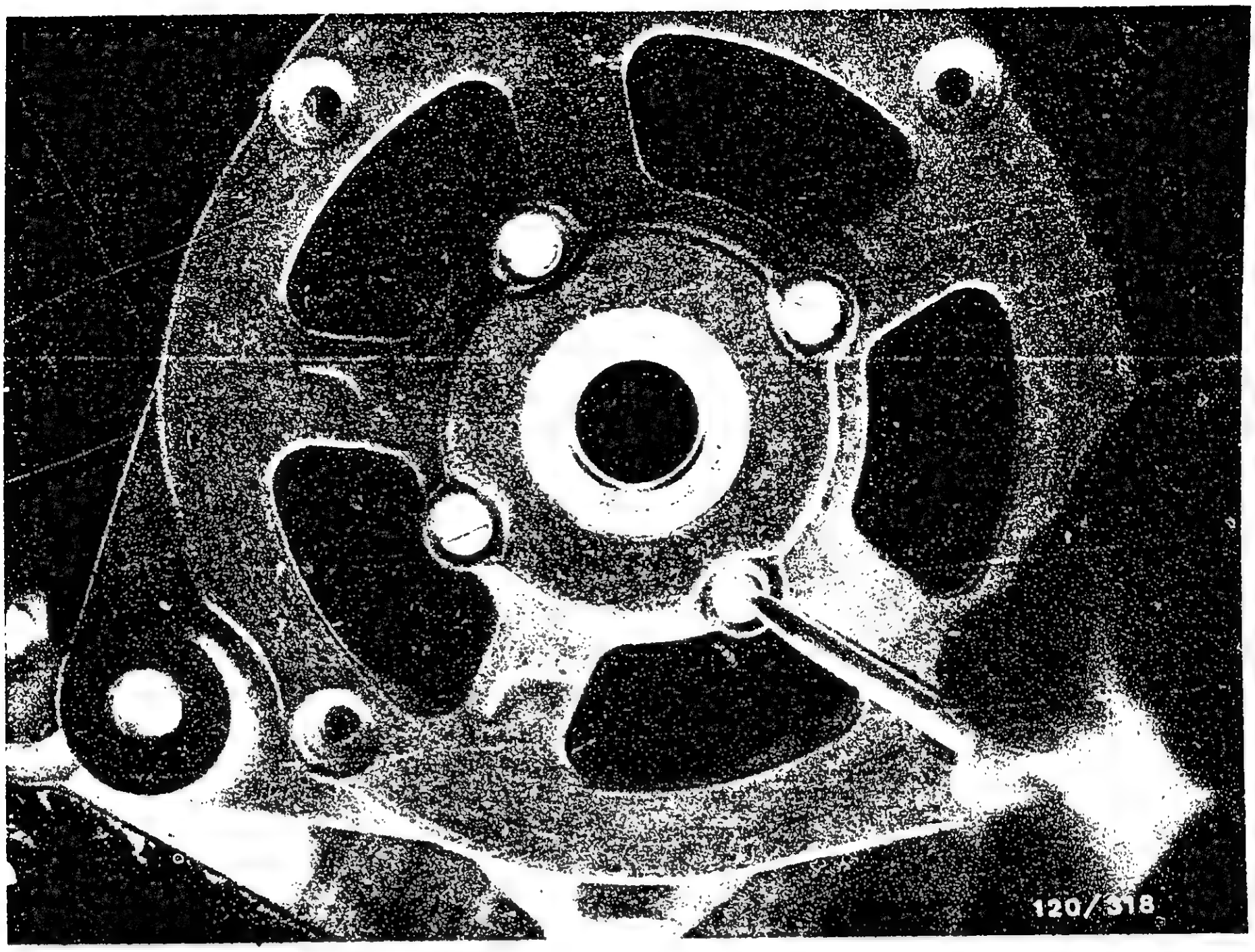
Alternators are being increasingly fitted with long-storage capacitors (e.g. for the interference suppression of receivers and transmitters).

When washing parts of the alternator it is possible for the capacitor to discharge when immersed in cleaning fluids, there then being the danger that inflammable liquids will ignite. For this reason, parts with capacitors must only be washed in tri- or perchloroethylene.



9. Assembling the alternator

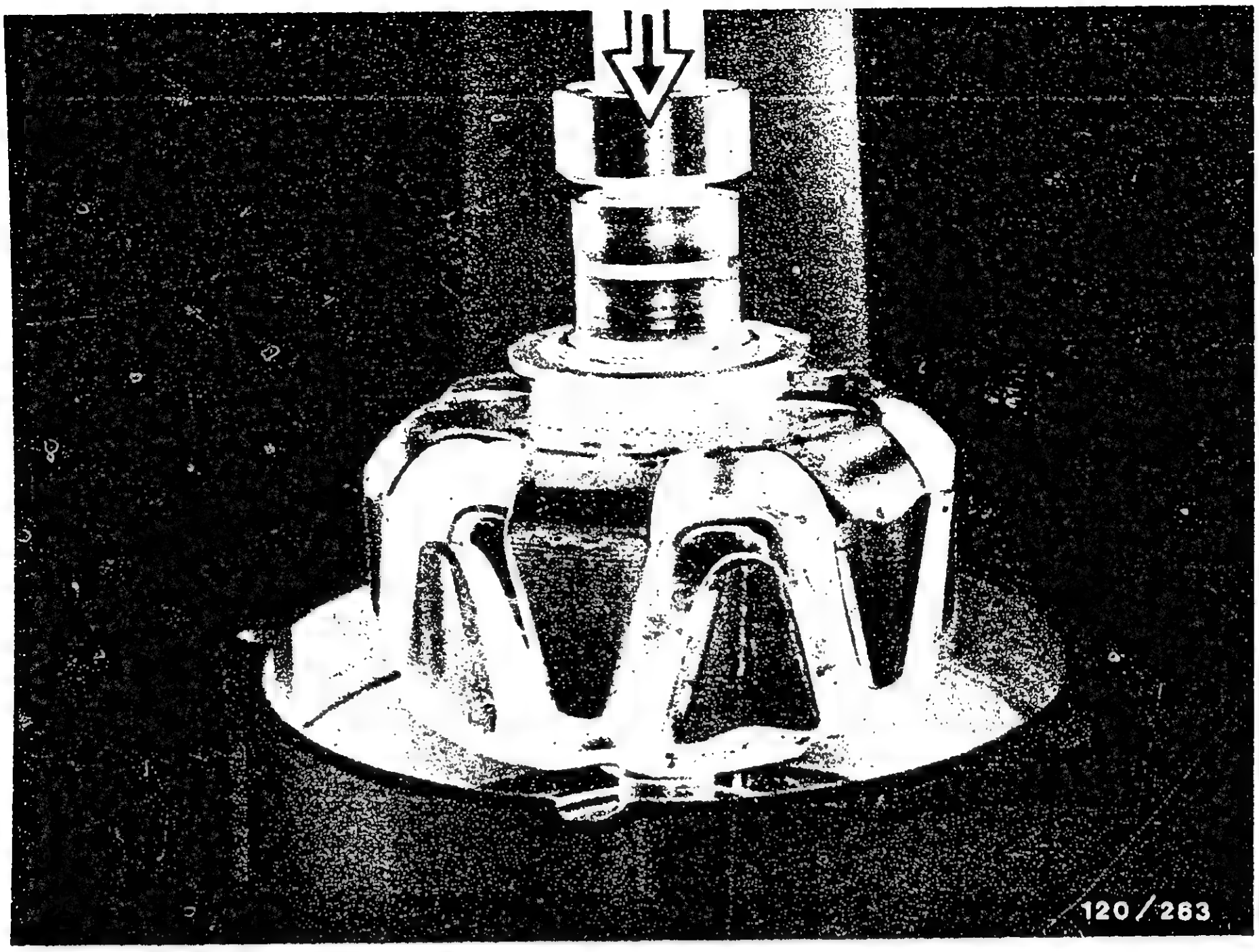
Pressing on the collector rings
Place the collector rings on the rotor shaft. Introduce one lead from the excitation winding into the groove in the collector rings. Then press on collector rings as far as they will go using press-on tool KDLJ 6004/1 and 6004/0/1. When doing this, position the groove of the press-on tool so that the lead of the excitation winding which is guided through the collector rings is visible.
Solder the wire leads of the excitation winding. Turn down the soldered joint on both collector rings until the collector rings are no longer uneven.



Assembling the drive-end-bearing housing

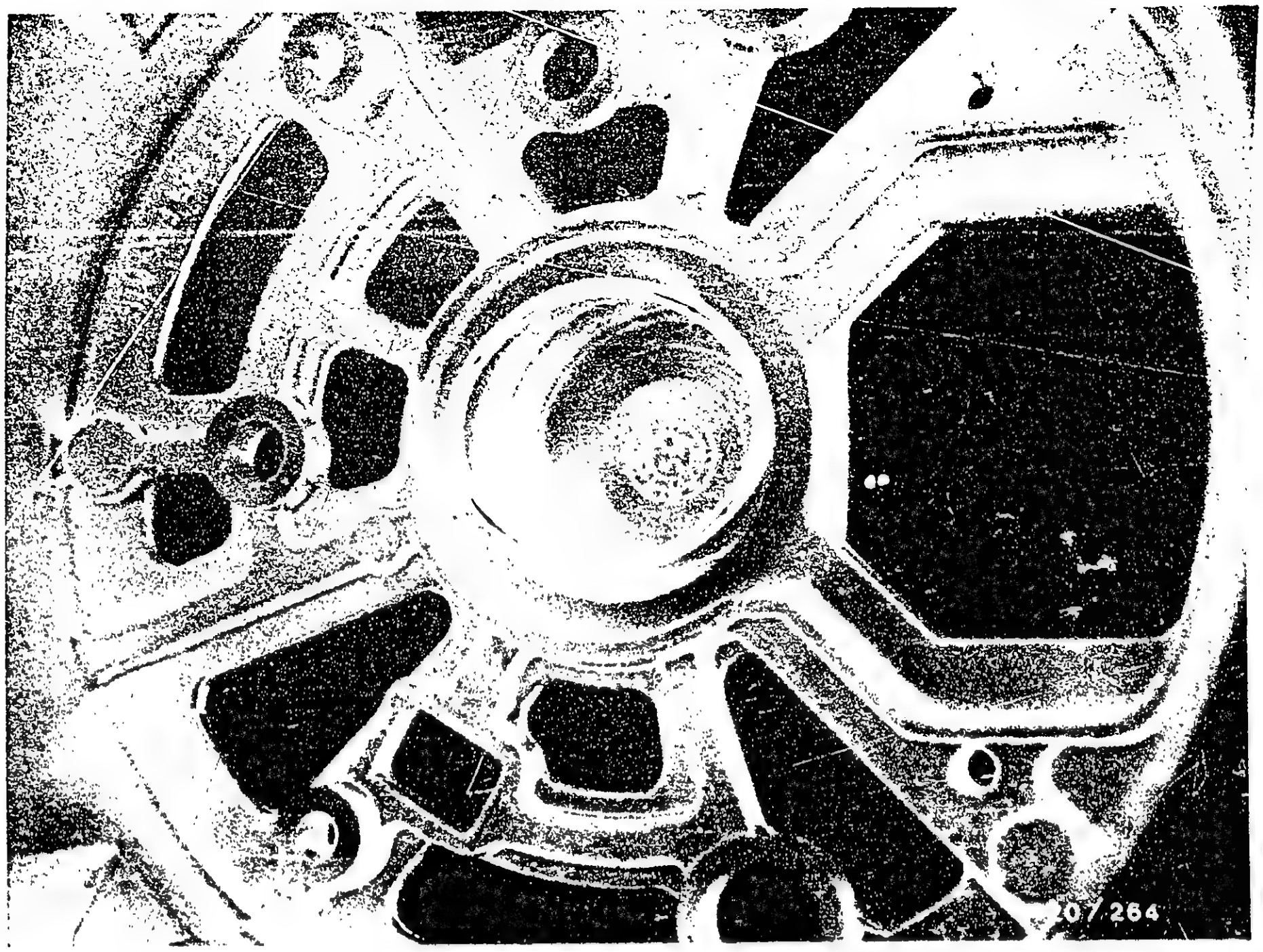
Insert a new deep-groove ball bearing in the drive-end-bearing housing.
Place a new cover plate on the inside of the drive-end-bearing housing.

Screw down cover plate from outside with 4 screws.
Tightening torque 2.2...2.9 mm.



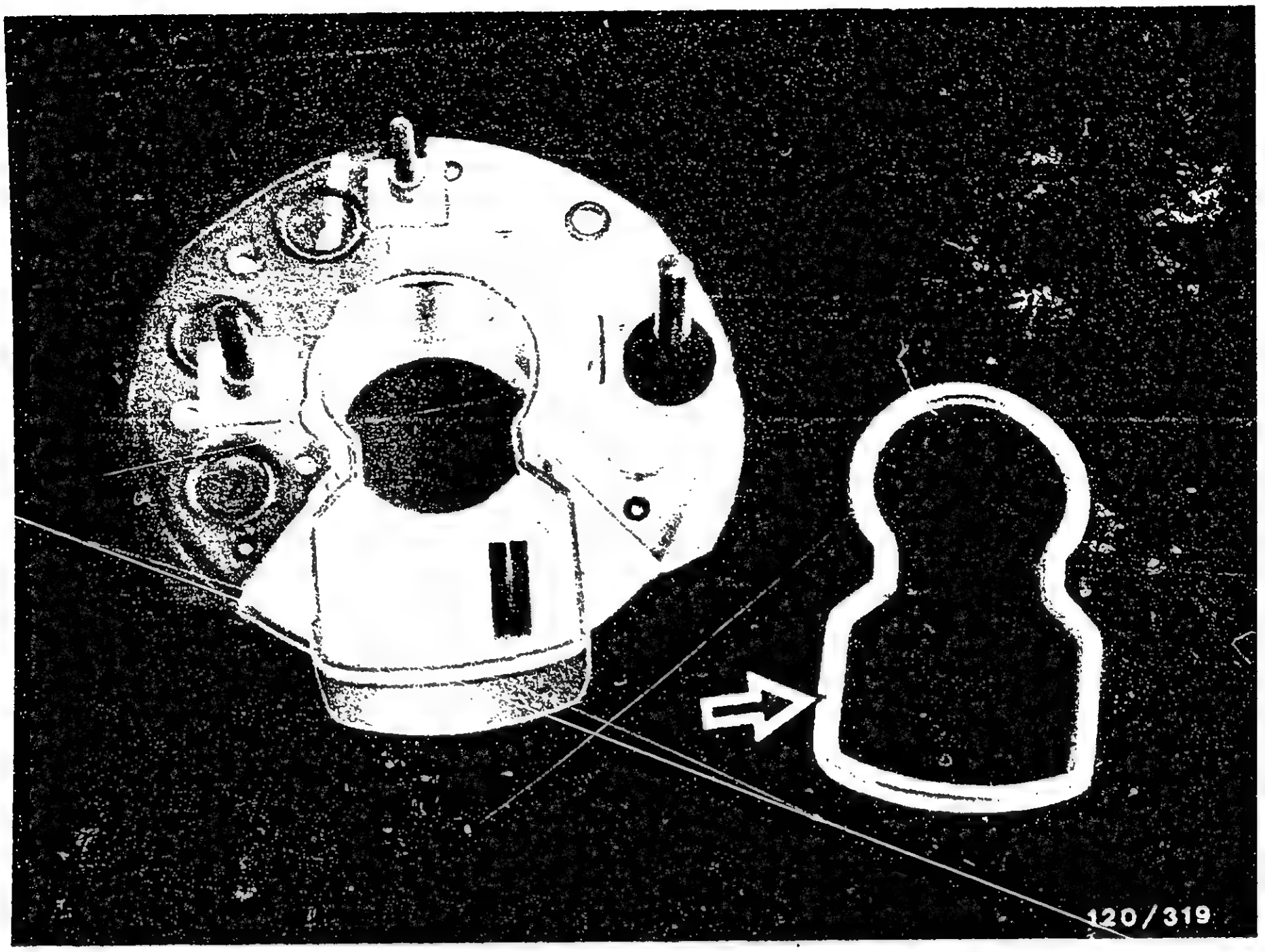
Pressing the rotor into the drive end shield

Insert grease slinger into drive end shield on fan side with the narrow collar facing the deep-groove ball bearing. Mount drive end shield on arbor press. Introduce rotor into deep-groove ball bearing (see picture). Place inner race of new deep-groove ball bearing (arrow) on collector-ring end of rotor shaft. Using press-in mandrel KDLI 6002, press inner race of deep-groove ball bearing and rotor into drive end shield as far as they will go.



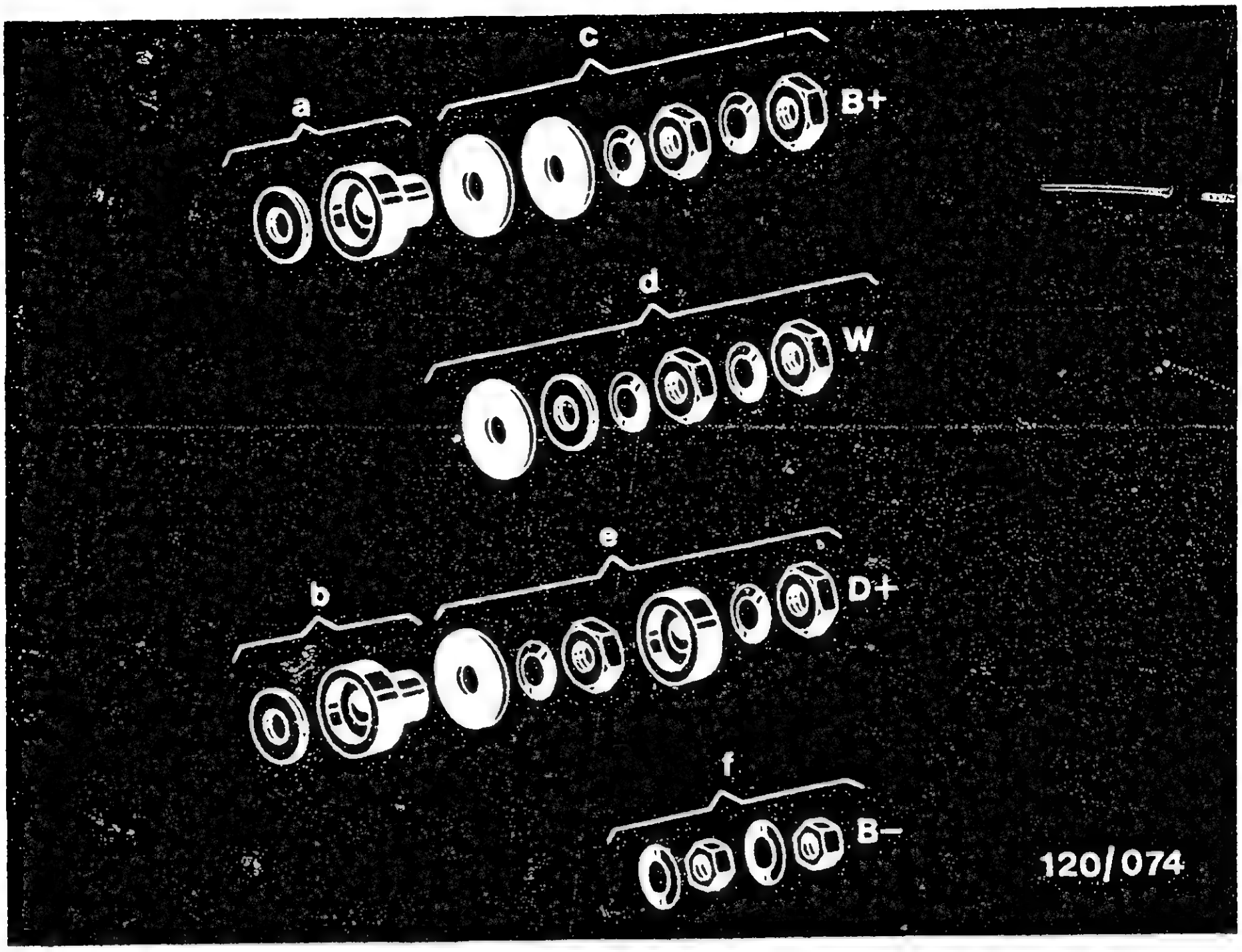
Changing the O-ring

Examine the O-ring in the collector-ring end shield for damage. If necessary, replace with a new O-ring.



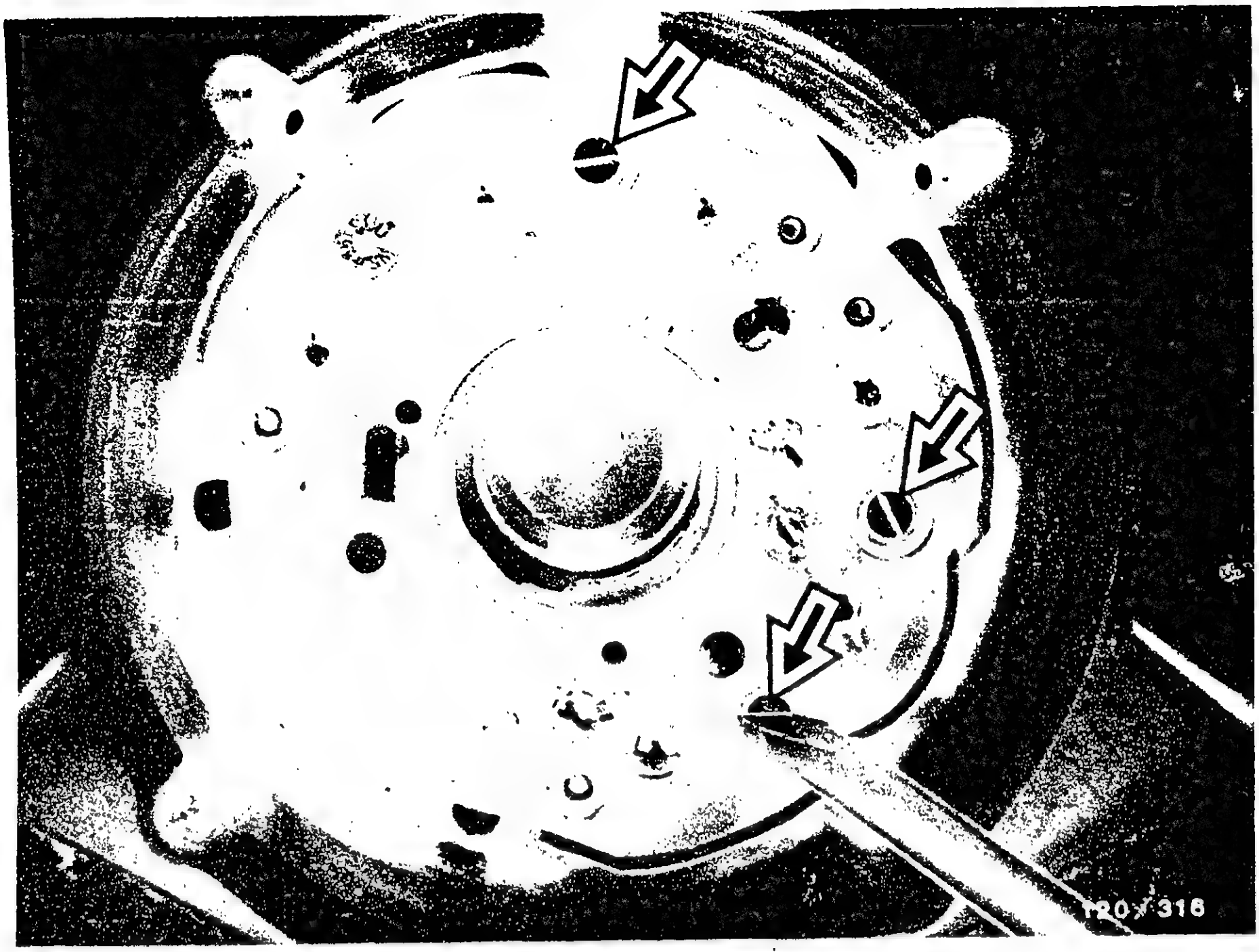
Installing the rectifier

Place seal (arrow) onto "keyhole"-shaped rim of rectifier and bond down all the way round with dispersion binder KK57v1 (5 703 151000).
Place plain washer and insulating bushing over terminals B+ and D+.
Introduce rectifier into collector-ring end shield.

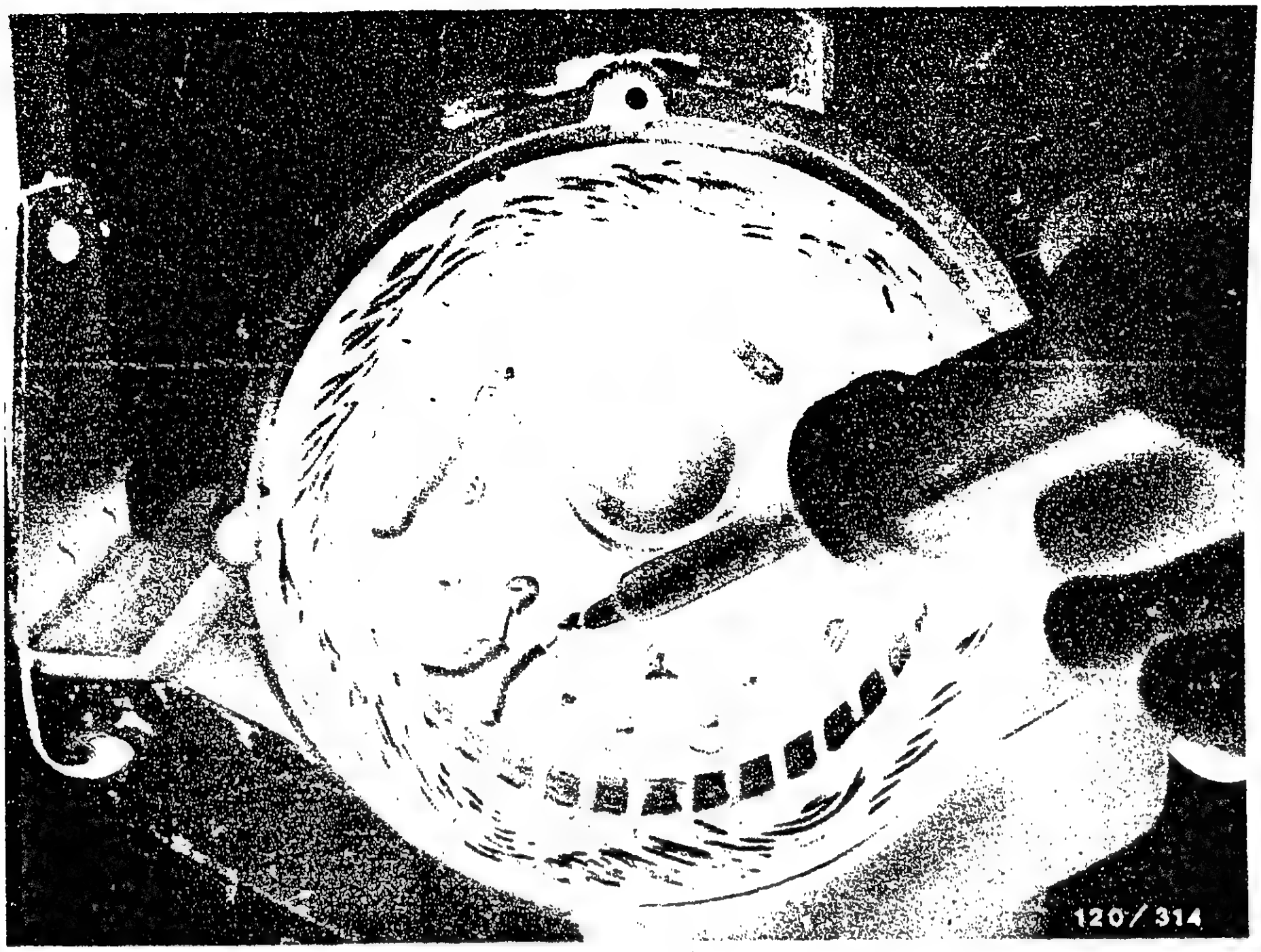


Fasten the rectifier at the terminal end using parts c, d, e, f.

Tightening torques:
Part c = 7.5 ... 8.0 Nm
Part d = 2.7 ... 3.8 Nm (if fitted)
Part e = 1.4 ... 2.0 Nm
Part f = 4.8 ... 6.8 Nm (if fitted)



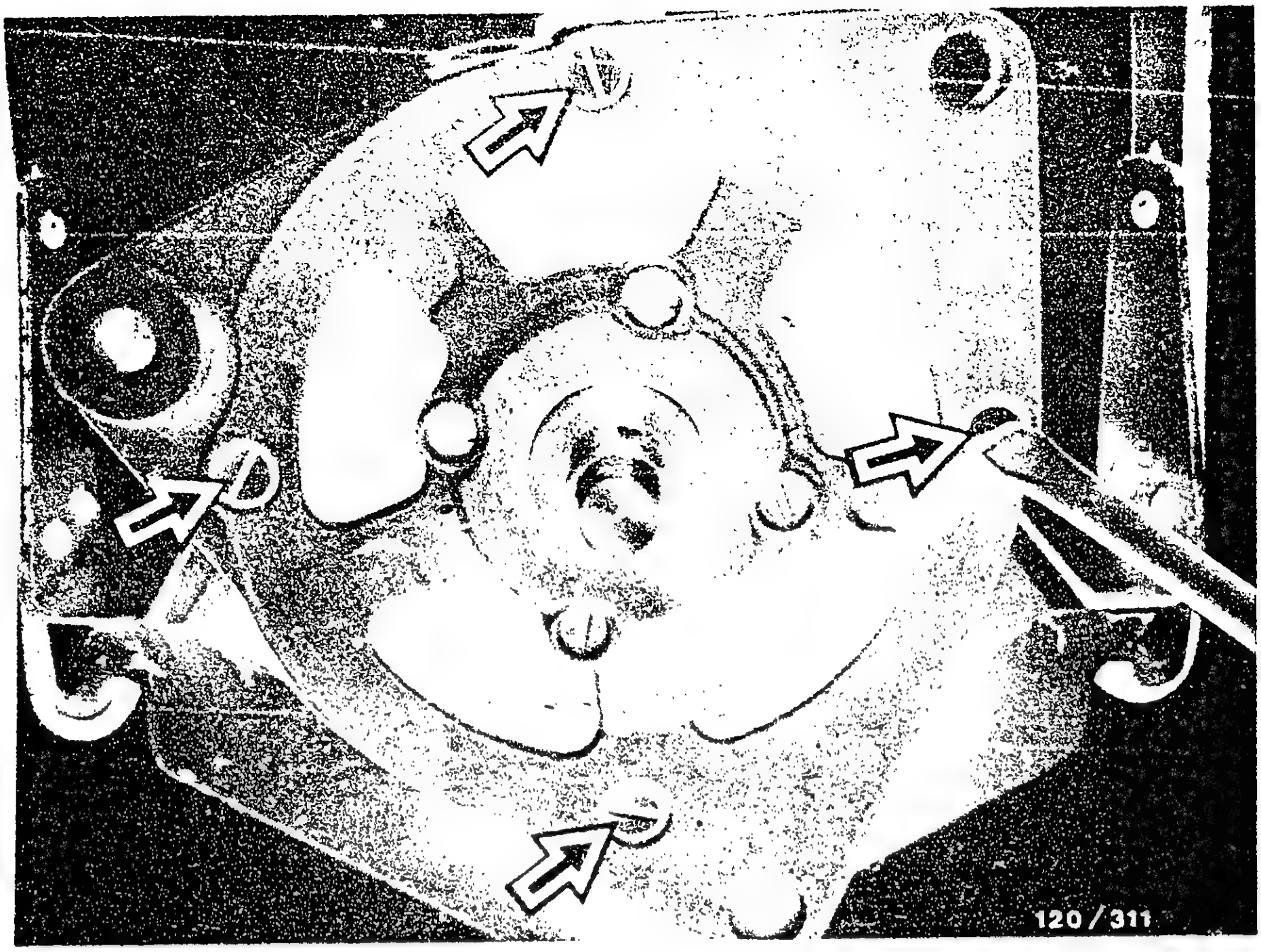
Screw down the rectifier on the alternator end with 3 washer-and-screw assemblies (arrows) - depending on the version of alternator.
Tightening torque: 1.3...1.7 Nm
Solder on terminal W again (see picture).



Fitting the stator and the rotor

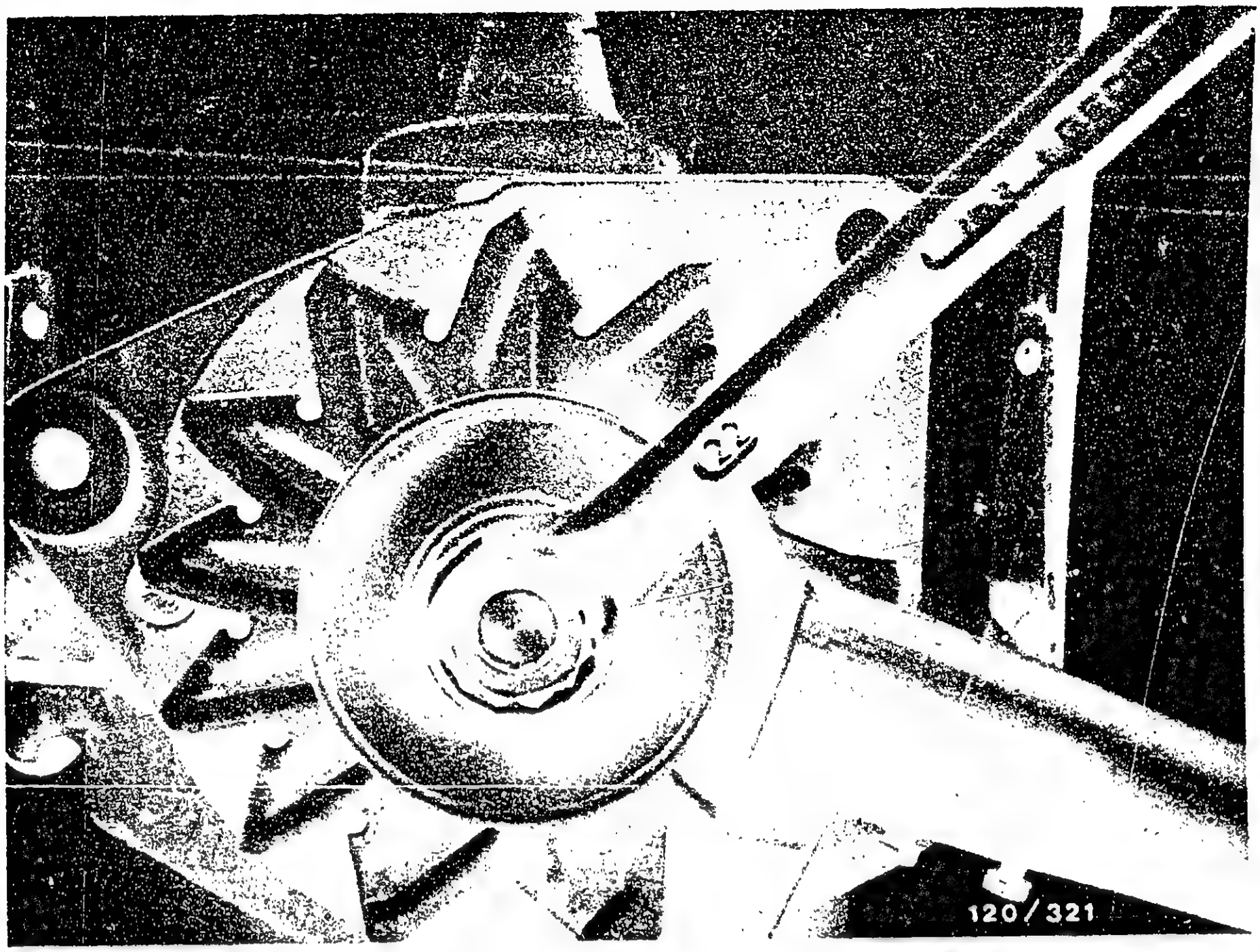
Place the stator against the rectifier bearing. Bring the markings on the collector-ring end shield and stator (made before dismantling the alternator) into alignment.
Solder on the connection wires of the stator (see picture). When doing this, make sure that the connection wires will not afterwards touch against the rotor. Carefully introduce rotor with drive end shield.

Note:
Do not use too much solder, otherwise short-circuit bridges can occur.



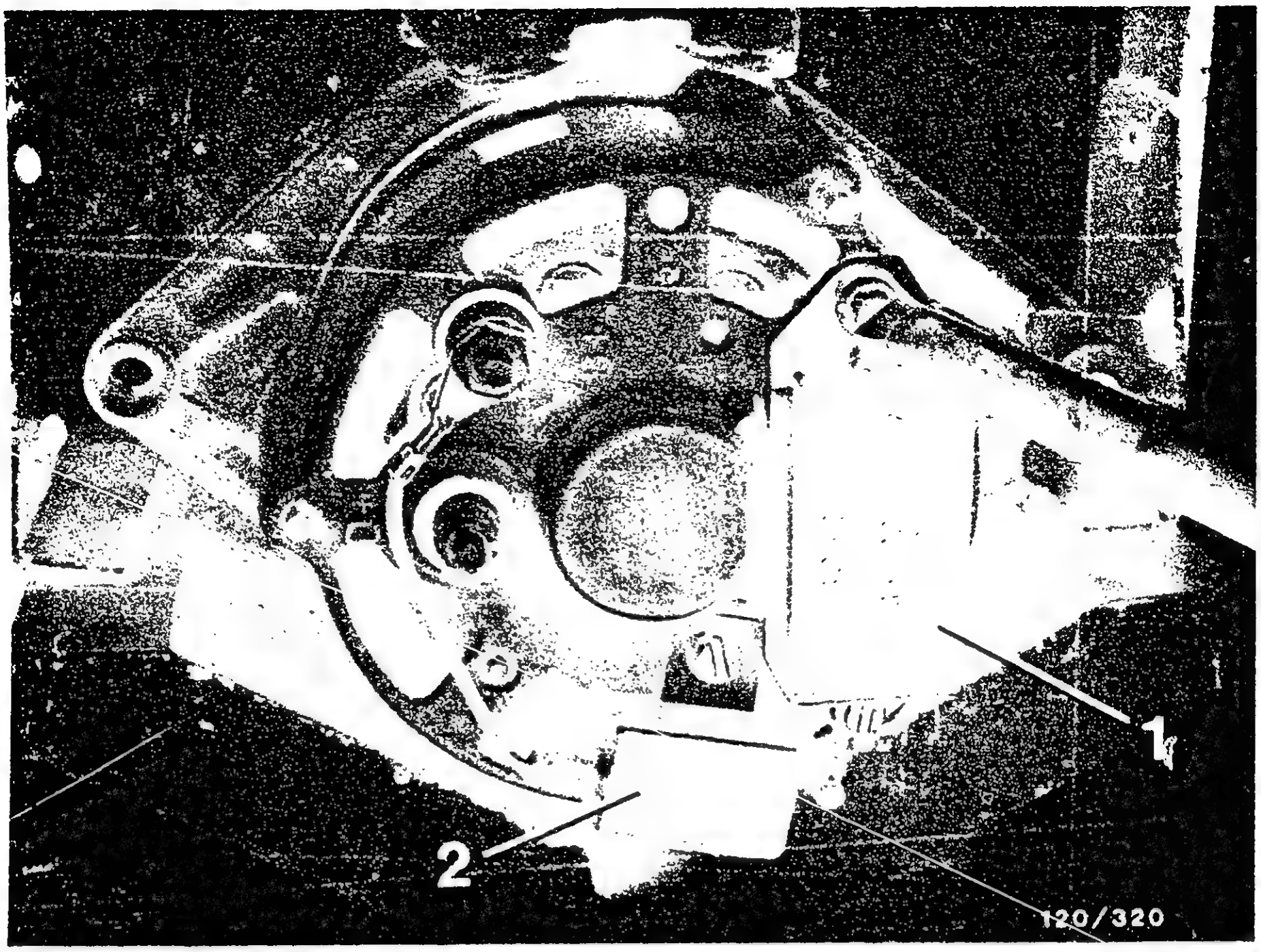
In order to obtain correct true-running of the rotor and alignment of the drive-end-bearing housing with the collector-ring end shield, the following operations are necessary:

Stick three feeler gauges, thickness 0.2 mm, between stator and rotor.
Using a screwdriver, position 4 fastening screws on the housing, then tighten cross-wise to a torque of 4.1...5.5 Nm.



Mounting the fan

Insert Woodruff key in groove. Slip new fan, right way round, onto shaft.
Mount parts of pulley in correct sequence on shaft.
Tighten pulley using holding device KDLI 6006 and 22 mm box wrench.
Tightening torque 35...45 Nm.



Installing the regulator

Introduce the regulator into the collector-ring end shield and screw on with 2 fastening screws.
Tightening torque: 1.6...2.3 Nm.

Screw on the capacitor.
Tightening torque 2.9...4.1 Nm.
Plug the connector of the capacitor onto B+ terminal.

In case of alternators with dust protection, insert gasket between brush holder and collector-ring end shield precisely into the form fit of the collector-ring end shield.

10. Testing the alternator with regulator on the test bench

10.1 Test equipment and devices

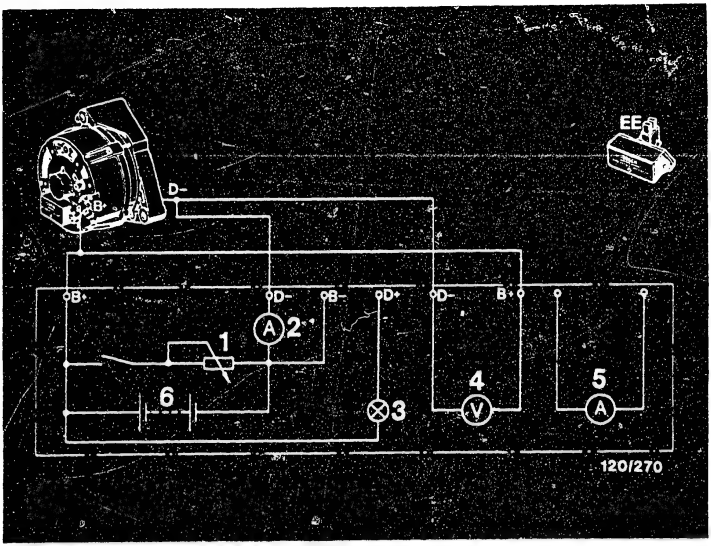
Alternator test bench	EFLI 91	0 683 300 100
or	EFLJ 25 ..	0 680 110 ...
or	EFLJ 70 A	0 680 104 ...
or combination test bench (only for loading up to max. 43 A)	EFAW 275 ..	0 681 107 ...
Mounting plate for mounting swivel-arm-mounted alternators on alternator test bench	EFLJ 66/3	
	EFLJ 25, 70	
Parts sets for mounting swivel-arm-mounted alternators on combination test bench		1 687 000 042
	EFAW 275 ..	
Alternator tester	WPG 012.00	0 681 101 403
For additional test:		
Ignition oscilloscope	(all models)	
or		
Bosch Motortester	(all models)	

Mounting on the test bench

Swivel-arm-mounted or flange-mounted alternators must only be mounted on the test bench using the appropriate clamping fixture.
So that the power of the test-bench motor is sufficient, only test using the appropriate fan and pulley. Select the correct transmission ratio.
For test bench EFLJ 25 .. the transmission ratio is 0.3:1. This means: If the alternator pulley is, for example, 100 mm Ø, use test-bench pulley with 350 mm Ø.
For test bench EFLJ 70 A the transmission ratio is 0.4:1. This means: If the generator pulley is, for example, 100 mm Ø, use test-bench pulley with 250 mm Ø.

Note: If, at very high alternator outputs, the drive power of the test-bench motor is not sufficient, then only carry out the test to the extent that the test speed does not drop at the required test current.

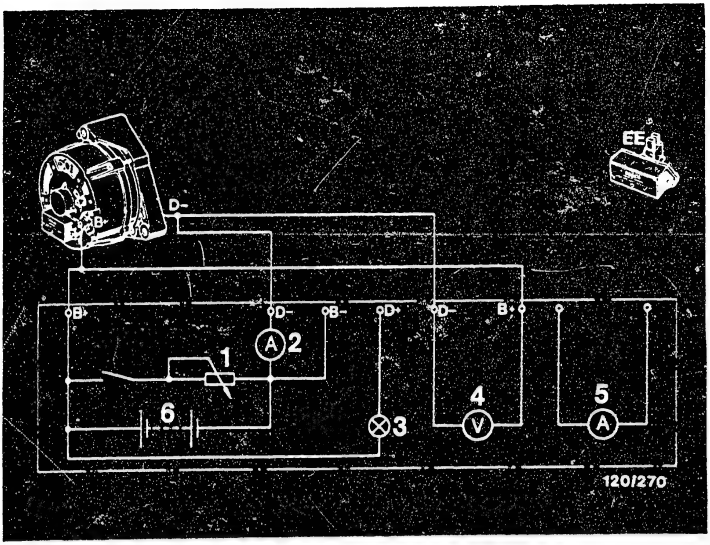
The charge indicator lamp must be completely out when power-testing.



1 = Loading resistor
2 = Ammeter
3 = Indicator lamp
4 = Voltmeter (regulated voltage)
5 = Ammeter
6 = Test-bench battery

Connecting the alternator to the test bench

Connect the positive battery cable of the test bench to B+ of the alternator.
If the clamping table on the test bench is used as a ground cable, make sure that there are no contact resistances. It is therefore advisable in the case of high-power alternators to connect the negative battery cable of the test bench directly to the alternator.
Connect voltmeter between B+ and B-.



1 = Loading resistor
2 = Ammeter
3 = Indicator lamp
4 = Voltmeter (regulated voltage)
5 = Ammeter
6 = Test-bench battery

Important:
All connections on the test bench must be properly made. When the alternator is running the connection between alternator and battery must not be disconnected since, otherwise, the semiconductors in the alternator and regulator may be destroyed.

Do not operate the alternator without the battery being connected.
If a direction of rotation is marked on the fan wheel or on the alternator, then the alternator must only be driven in this direction of rotation.

Power testing

Note: When power-testing, ensure that the current-limiting resistor built into the test bench is not connected into the circuit since, otherwise, the charge indicator lamp glows and gives the impression that there is a fault in the alternator.

For testing, the alternator is brought up to operating temperature (approx. 60°C) on the test bench.
Do this at a speed of 2000 min $^{-1}$.

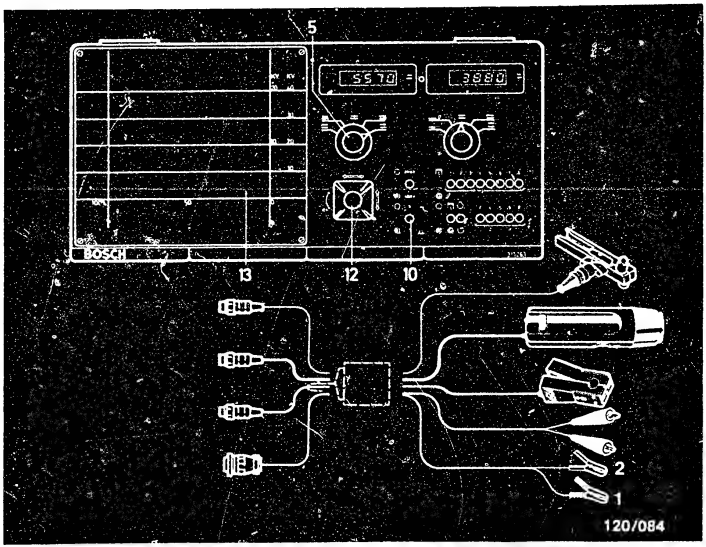
Power testing with regulator

Set the regulated voltage on the test bench to 26 V. First of all, bring the alternator up to the stated test speed. Then adjust the loading resistor until the stated current is reached. The indicated voltage must not drop below, or exceed, 26 V.

Alternators 0 120 400.., 0 120 489..,	Power test Speed min^{-1}	Load A
K1(RL)28V17A19	1200	5
	2000	12
	6000	17
K1(RL)28V18A21	1500	5
	2100	12
	6000	18
K1(RL)28V21A21	1200	5
	2100	14
	6000	21
K1(RL)28V25A19	1050	5
	1900	16
	5000	25
K1(RL)28V27A23	1350	5
	2300	18
	6000	27
K1(RL)28V35A24	1300	5
	2400	23
	6000	35
K1(RL)28V45A27	1750	10
	2750	30
	6000	45

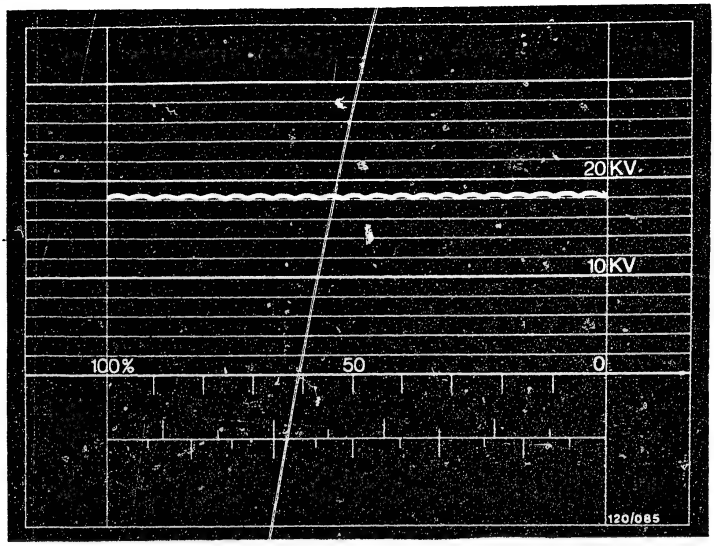
Testing the regulated voltage Load current ≤ 10A

Regulator part number	Type code	Regulated voltage V
0 192 033 001	ED28V3	27.2...28.2
0 192 033 002	ED28V3	27.5...28.5
0 192 033 003	ED28V3	27.5...28.5
0 192 033 004	ED28V3	27.4...28.4
0 192 033 005	ED28V3	27.4...28.4
0 192 053 001	EE28V3	27.6...28.4
0 192 053 002	EE28V3	27.6...28.4
0 192 053 004	EE28V3	27.6...28.4
0 192 053 005	EE28V3	27.6...28.4
0 192 053 006	EE28V3	27.6...28.4
0 192 053 007	EE28V3	27.6...28.4
0 192 053 008	EE28V3	27.6...28.4
0 192 083 001	ED28V3	27.4...28.4
0 192 083 002	ED28V3	27.4...28.4
0 192 083 003	ED28V3	27.4...28.4



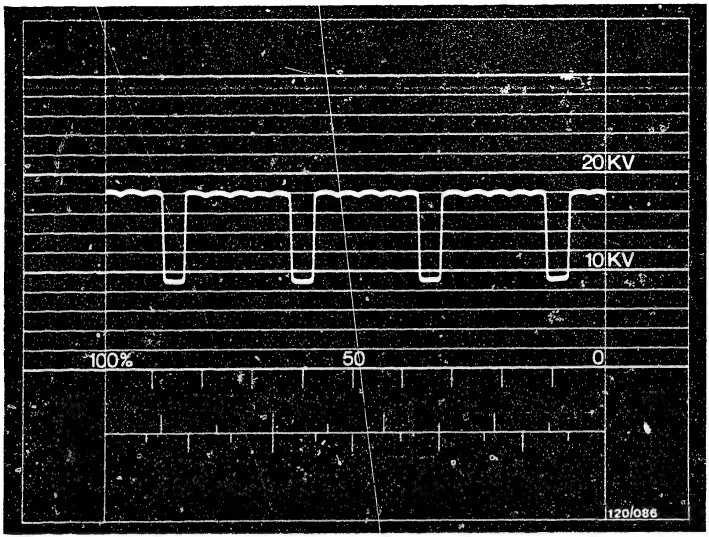
10.2 Testing with the oscilloscope

Connect oscilloscope (MOT 002.00) to the alternator using corresponding test lead.
Red clip (1) to terminal D+.
Black clip (2) to terminal B+ (ground).

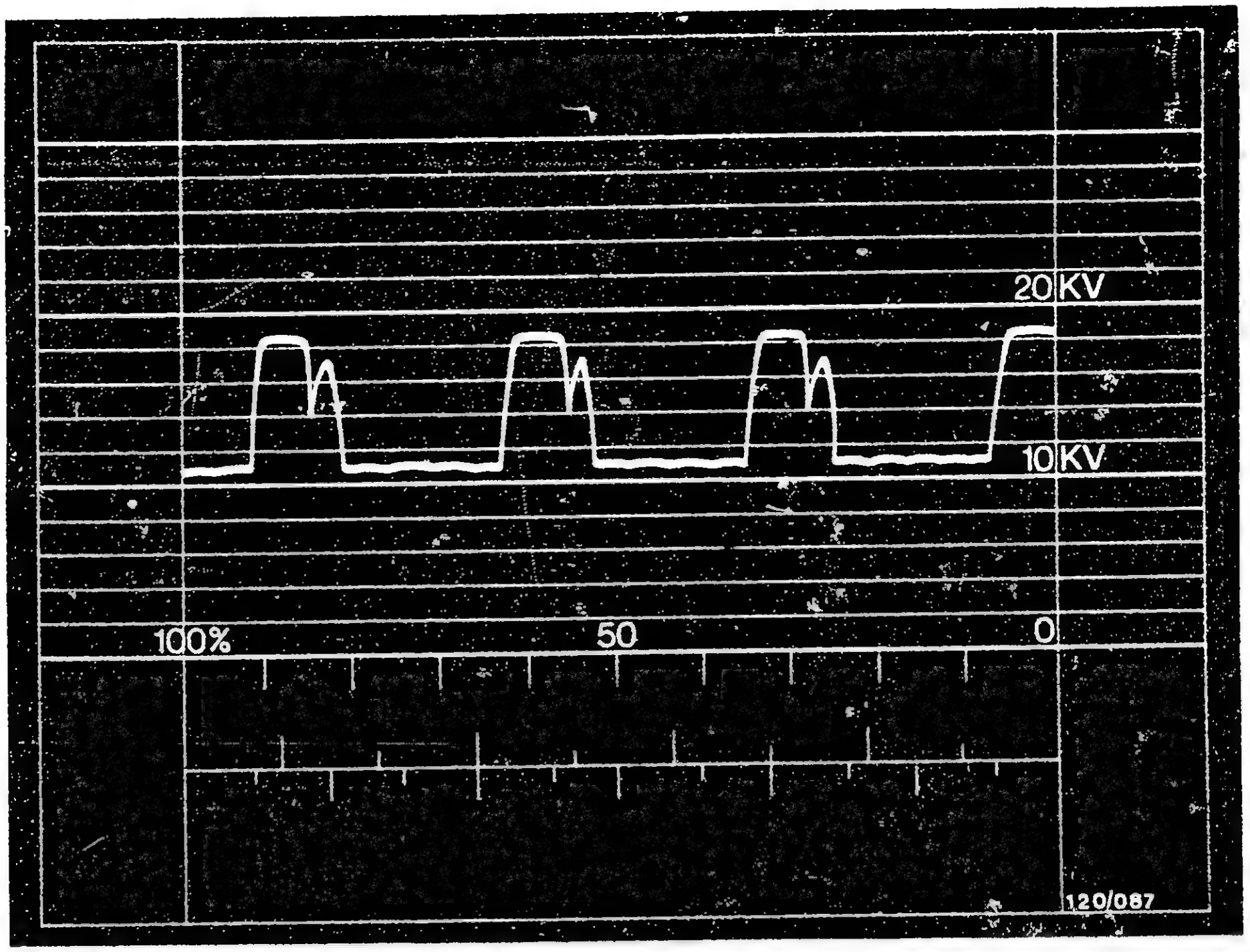


Adjusting and evaluating the oscilloscope displays

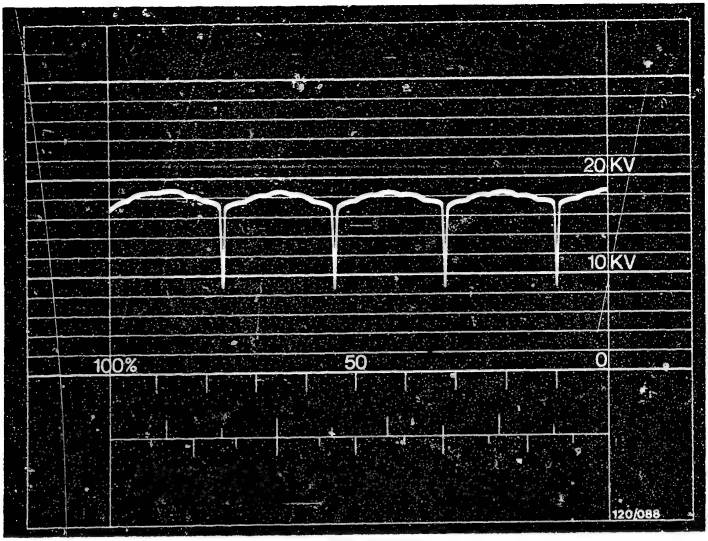
If the alternator is in proper working order, the above display is obtained. The DC voltage supplied has a slight ripple content. The oscilloscope display may have small spikes superimposed on it when the regulator is in operation. The regulator can be "shut down" by connecting in a load (e.g. loading resistor).
Adjust the height of the display so that the ripple content is between two kV lines.
In order to compare such displays, the respective display must be adjusted using the vertical controller of the oscilloscope so that it more or less fits in between the 10 and 20 kV lines.
Note: It is also possible for several defects to occur together.



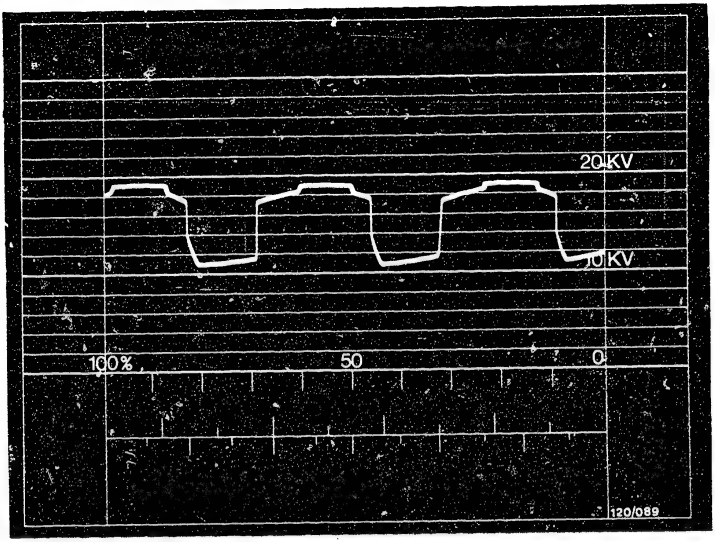
Oscilloscope display shows open circuit in an exciter diode



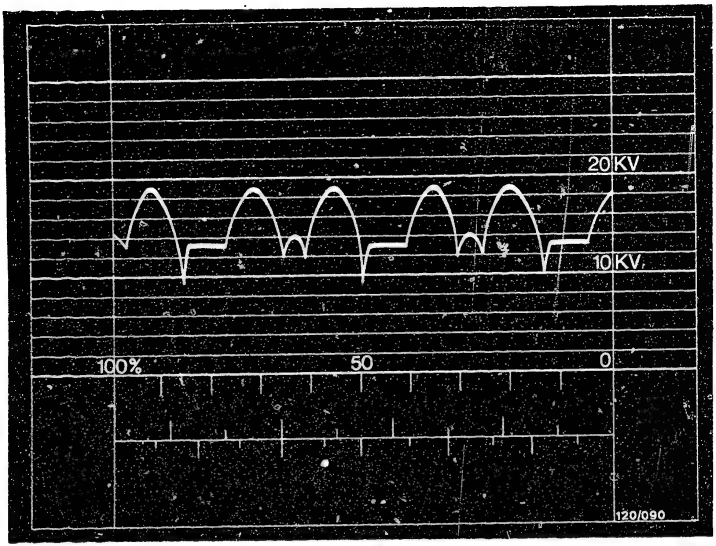
Oscilloscope display shows open circuit in a positive diode. If a number of diodes are connected in parallel in an alternator, then this display only appears if all the diodes are open-circuit.



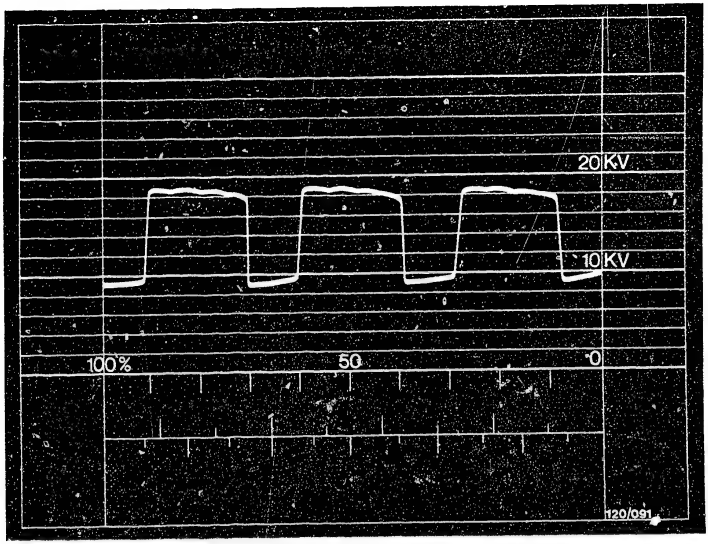
Oscilloscope display shows open circuit in a negative diode. If a number of diodes are connected in parallel in an alternator, then this display only appears if all the diodes are open-circuit.



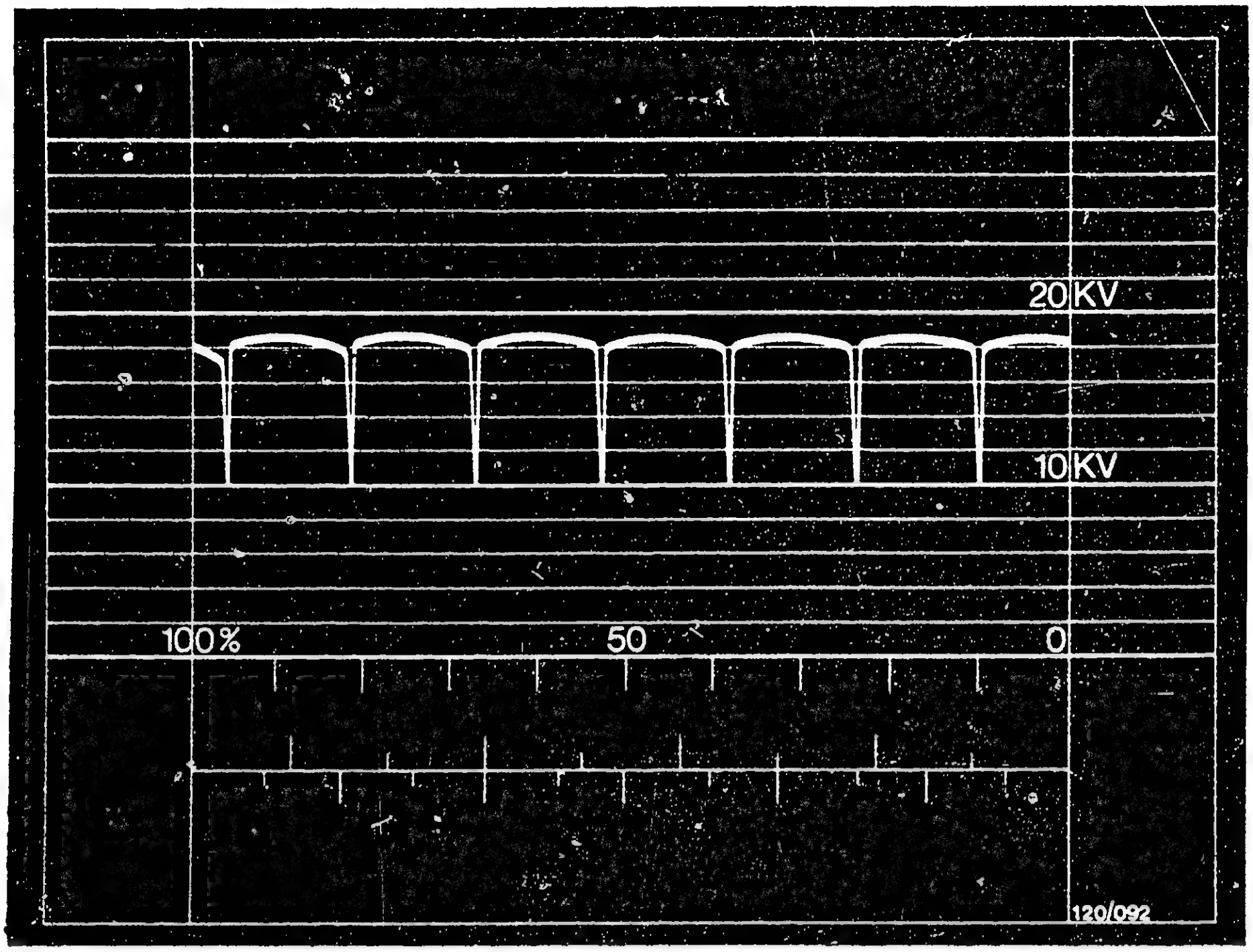
Oscilloscope display shows short circuit in an exciter diode



Oscilloscope display shows short circuit in one or more positive diodes.



Oscilloscope display shows short circuit in one or more negative diodes.



Oscilloscope display shows phase defect (open circuit)

After-sales Service

Technical Bulletin

Parts Cleaning

Use of highly-inflammable cleaning agents, or cleaning agents which are dangerous to health

Gen.

VDT-I-Gen./18 En
7.1978

When cleaning parts which come from vehicle electrical products prior to repair, it is permitted to use the following cleaning agents: Benzine, trichloroethylene (tri) and perchloroethylene (per). These are dangerous, and must be handled with appropriate care. The relevant safety regulations in West Germany are:

Regulations concerning work with inflammable liquids (VbF) issued by the Federal Labor Ministry (BmA).

Safety regulations for the use of chlorinated hydrocarbons
as applied to the works ZH1/222
as applied to personnel ZH1/119
as issued by the Federation of the Trade co-operative Associations (Central Association for Accident Prevention and Industrial Medicine) Langertweg 103, D-5300 Bonn 5).

1. Benzine, acetone and ethanol (ethyl alcohol) are inflammable liquids and their mixtures with air are dangerous due to the risk of explosion. Parts washing may only take place in tanks or containers solely intended for this purpose and equipped with a "melt" safety device for the lid which, in case the liquid catches fire, causes the lid to close automatically and smother the fire. In the case of larger containers (exceeding 500 x 500mm) some form of suction extraction must be provided.

1.1 Generators, alternators, wiper motors, small-power motors and other electrical equipment for installation in vehicles are, in ever increasing numbers, being equipped with capacitors having long storage times (e.g. for interference-suppression purposes in radio-receiver or transmitter installations).

When washing such parts, it is possible that a capacitor discharge can occur when the part is immersed in the cleaning agent. This can lead to an inflammable liquid catching fire. For this reason, parts on which a capacitor is fitted are only to be washed in trichlorethylene (tri) or perchloroethylene (per).

1.2 In the case of starting motors, it has already been pointed out in earlier repair instructions that the parts should be thoroughly dried after washing in benzine, this applies particularly to windings. With sliding-gear starting motors, the first test run after washing out must be performed without the closure cap in order to avoid the possibility of explosion.

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2. Trichlorethylene (tri) and perchlorethylene (per) are both liquids whose vapors have a stupefying effect, and which are dangerous to health if inhaled over long periods. Tri vapor is heavier than air, and therefore especially dangerous at floor level. Gloves and goggles are to be worn when washing out parts in these liquids.

   If cleaning of parts is carried out regularly, or continuously, in trichlorethylene only containers or tanks intended solely for this purpose are to be used, and the suction extraction device is to be switched on. When washing parts do not bend over the container.

After-sales Service

Technical Bulletin

Sheet Steel Fans for Alternators of Sizes G and K

12

VDT-I-120/103 B
9.1976

Fan discs, primarily produced from galvanized sheet steel, are subjected to varying loads during operation, the magnitude of which depends on the driving habits of the operator.

Please note that, as a safety measure, when repairing or replacing alternators that have been used for more than 100,000 km or for 2,000 operating hours, new sheet-steel fan discs should be installed.

When doing this, be sure that the direction of rotation of the fan disc, as well as the sequence and position of accessories, are correct.

Tightening torque for the fastening nut: 35 - 45 Nm.

In case of inquiry, please contact your authorized representative.

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After-sales Service

Technical Bulletin

Steel sheet fan wheels for alternators

Assembly instructions

12
VDT-I-120/103 B
Suppl. 1
7.1977

Summary

When assembling the fan wheel and pulley, attention is to be paid to the correct sequence and position of the accessories, in particular the new supporting plate. See Figs. 1 ... 4 for assembly examples.

Details

Since the end of 1976 supporting plate 1 120 140 009 has been mounted between the fan and pulley assembly within the scope of further development for various alternators provided with steel sheet fan wheels.

The outside diameter of this new supporting plate (item a) is 55 mm. The 5 mm wide and approx. 0.3 mm high stamping on the rim presses against the fan. A slotted washer (item b) or the pulley itself is mounted directly on the side facing the pulley, depending on the alternator model. Care is to be taken that the 26 mm diameter collar of the slotted washer or pulley presses against the supporting plate.

In the case of steel sheet pulleys a second slotted washer (item c) is mounted between the pulley and spring lock washer. The spring lock washer or spring washer, as well as the fastening nut remain unchanged.

The tightening torque for the entire assembly continues to be 35 ... 45 N.m (approx. 3.5 ... 4.5 kgf.m).

Tool KDLJ 6006 is required to hold the pulley when tightening the nut.

> Under no circumstances should the fan wheel be locked using a screwdriver or similar. Bent or damaged fan blades result in damage to the alternator.

In the case of alternators which are provided with the supporting plate ex-works, this plate must also be installed when repair work is performed. Basic information regarding use is provided by the service part documents and packing notes for service part packages. Supporting plate 1 120 140 009 is included in the scope of delivery of the pulley.

> The complete assembly is matched to the alignment of the V-belt. Modifications or assembly errors may cause damage.

Careful replacement of the steel sheet fan wheel when repairing or exchanging the alternator after operating for more than 100 000 km or 2000 running hours is still required.

Assembly examples for supporting plate 1 120 140 009

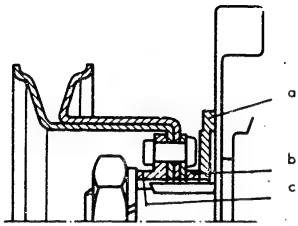

Fig. 1 Single-piece steel sheet pulley with deep hub

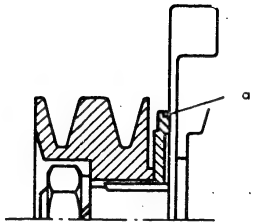

Fig. 2 Solid single-piece pulley

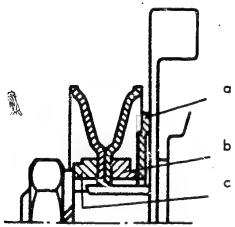

Fig. 3 Two-piece steel sheet pulley

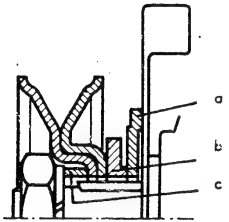

Fig. 4 Offset two-piece steel sheet pulley

Designation of individual components

a Supporting plate 1 120 140 009
b Rear slotted washer
c Front slotted washer

After-sales Service

Technical Bulletin

EXTERNALLY MOUNTED TRANSISTOR REGULATOR 14 V .. 12

1 197 311 .. VDT-I-120/106 En

2.1980

Supersedes Fd. 9.78

In addition to the already familiar EE externally mounted transistor regulators 0 192 052 .., the regulator 1 197 311 .. (EL 14 V ..) is finding increased application on a variety of different alternator models.

In case of complaints regarding the EL regulator 1 197 311 001/002 - for alternator collector ring with 32 mm diameter - the EL regulator 1 197 311 001 as well as the EE regulator 0 192 052 006 can be used as replacements.
When fitting an EE regulator, it must be taken into account that the housing is larger, that is, fitting space must be available.

The EL regulator 1 197 311 003 and ..004 for alternator collector rings with a diameter of 28 mm can only be replaced by the model 1 197 311 003.
This regulator is fitted with a 68Ω resistor between D+ and D-.

Further EL regulator models not listed here, and their replacements, are to be found in the EE microfiches of the alternators concerned.

It is not possible to fit a regulator with lengthened brush holder (for alternators with collector-ring diameter 28 mm) to alternators with collector-ring diameter 32 mm. Neither can the regulator with lengthened brush holder for 32 mm diameter be fitted to the 28 mm dia. model.

The production of alternators with a collector-ring diameter of 28 mm instead of 32 mm is increasing.

Warranty procedure

The normal warranty conditions apply to the regulator 1 197 311 .. (EL 14 V ..).
In the case of justified complaints, the precise part number of the alternator is to be entered in the column for the damaged product.

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After-sales Service

Technical Bulletin

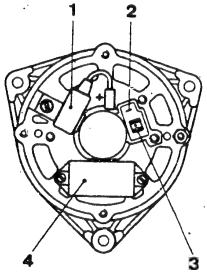
SOLUTION TO THE WIRING-HARNESS REPAIR PROBLEM 12

on alternators with attached-type regulators and plug-in connection for S+ and D+ VDT-I-120/106 En 3.1979

On most vehicles the cable connections from the alternator/generator are welded to the wiring harness plug. This means that if the plug is damaged, a repair cannot be carried out.

In order to make repair possible, therefore, we have introduced a plug housing with 3 blade terminals into the program. Part Number: 1 297 011 001. Remove the old plug-in connection, strip about 1 cm of insulation from the wire and crimp on the new blade terminals using the Eisemann crimping tool. Fit the blade terminals in the plug housing.

This parts set will be included in the service-parts lists for the generators/alternators in question.



1 = Suppression capacitor
2 = Blade terminal 6.3 x 0.8 (D+)
3 = Blade terminals 9.5 x 1.2 (B+)
4 = Transistor regulator

Fig. 1 Plug-in connection

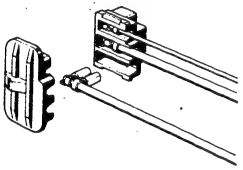


Fig. 2 Plug housing with blade terminals

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Technical Bulletin

ALTERNATORS 0 120 ..

12
VDT-I-120/107 En
9.1979

Alternator operation without battery

General

Unless special measures are taken, alternators are not to be operated without the battery connected because otherwise this can lead to the destruction of semiconductor components in the regulator, alternator or vehicle electrical system.

In the case of special-purpose vehicles, auxiliary or stationary equipment, or vehicle export, it can be necessary for the alternator to operate without battery - with or without power output.

With systems where the regulator is mounted separately from the alternator, the alternator is placed out of operation before starting by open-circuiting the line between it and the regulator. Power output is now impossible.

This method cannot be used with systems having an attached-type regulator. In such cases, the following methods are used. Details can be taken from the product specifications.

1. Systems with increased voltage-proof characteristics

A variety of vehicle manufacturers order such systems because during shipping it can occur that operation takes place without battery. In such exigencies, power output is possible depending upon alternator speed. These measures protect the alternator and regulator but not th loads.

2. Zener diode 1 127 328 .., for 14 V alternators and max. 35 A

This Zener diode is connected to Terminal B+ of the alternator. If the voltage rises above the response voltage of the Zener diode this conducts and the voltage peak is conducted away through the diode heat sink to the alternator housing. In this way semicon-

ductors in the alternator and regulator are protected against voltage peaks and if necessary the system can deliver power. If required, this Zener diode can be fitted as series equipment on new alternators or can be retro-fitted. Connection in parallel or series of these Zener diodes for the purpose of increasing the power is not possible.

Notes on testing are contained in Instructions VDT-W-120/300.

Burnt-out connections between Zener diode and alternator B+ are the result of false polarity during battery change, use of auxiliary starting aids or operation with 24 V etc. Warranty claims are therefore to be rejected.

3. Systems with over-voltage protection devices fitted

For years, such devices (OSG) have been available either integrated in the regulator e.g. 0 192 083 .. or separate 0 192 900 .. for use in 28 V systems.

When voltages occur in excess of the OSG response voltage, the Terminals D+ and D- are connected together by the OSG. The alternator is short-circuited and cannot self-excite. This means that resultant damage in the vehicle electrical system due to excessive alternator voltage is avoided.

As long as the OSG does not conduct, without battery connected, the alternator can deliver power.

4. Short-circuit capsule 1 120 505 000 for K1, N1 and T1 alternators

In order that the alternator does not self-excite during operation without battery, Terminals D+ and D- are connected together. At customer request, certain alternator models are equipped at the works with a short-circuit capsule connected to Terminal D+ for this reason. This enables engines and vehicles to be tested on dynamometers etc. without the battery being connected. Power cannot be taken from the alternator.

After the battery is connected the capsule is removed so that the system is ready for operation. If, subsequently, operation without battery is required, D+ and D- must be connected together again.

Details regarding the Part Numbers of the products dealt with in this Bulletin can be requested from your local Bosch representative.

After-sales Service

Technical Bulletin

ALTERNATOR. VDT-I-120/111 En

for BMW boat engines with ignition safeguard 2.1980

Part No. 0 120 489 890, ..981

General

The US Coast Guard Regulations for gasoline-driven boat engines demand a so-called "ignition safeguard" in the products for the electrical engine equipment (including the alternator). This is to make sure that explosions do not occur when operated in a combustible atmosphere.

"Ignition safeguard" characteristics

The following special precautions have been introduced in alternators with "ignition safeguard":-

a special shaped cover disc on the rotor;

modified shoulder on the rotor side of the rectifier.

both these measures result in a lengthened air gap in the labyrinths between the rectifier and the rotor;

additional seal between the regulator 0 192 052 021 and the brush holders.

Workshop instructions

When doing repair work on alternators, e.g. when replacing the rectifier, you should make sure that the centre bore in the rectifier housing is concentric with the bearing seat in the collector-ring end shield.

After soldering the new soldered and welded points should be insulated with lacquer coating no. 190 from the firm of Dr. Beck, Postbox 180-280, D-2000 Hamburg or with insulating lacquer of the insulating classes A, E and B as per IEC 85/VDE 0 530 and per temperature index 130...140 according to IEC 216. The drying out time for the lacquer is approx. 24 hours at room temperature.

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After-sales Service

Technical Bulletin

DAMAGE TO THE DRIVE-END-BEARING HOUSING
BY PRESSING OUT THE ROTOR ON VW AND
AUDI ALTERNATORS

VDT-I-120/115 En
3.1981

Alternators 0 120 4..

Due to the conversion of certain K-alternators for VW and Audi to drive-end bearings press-fitted to the shaft, the drive end shield or support plate which is screwed from the inside on these alternators, can be damaged when the rotor is pressed out.

When pressing out the rotor a three-arm puller, part no. 57-036 from the firm of Schrem in 7928 Giengen 1, Postfach 1504, should be used.

Apply the puller to the drive-end bearing in such a manner that the arms grip behind the support plate. Only in this way can one guarantee that the fastening screws will not be broken off when the rotor is pressed out.

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung.

After-sales Service

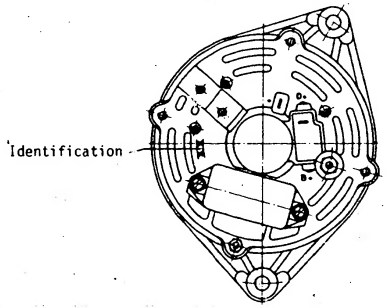
Technical Bulletin

ADDITIONAL IDENTIFICATION OF ALTERNATORS 0 120 ..

VDT-I-120/116 En
4.1981

Since date of manufacture FD 143 (March 1981) the alternators fitted with stick-on nameplates have received an additional identification. This takes the form of stamping the last 4 figures of the appropriate part number on a suitable place on the front of the collector-ring end shield. The figures are 4 mm high. The exterior characteristics of the alternators make it possible to find out the remaining 6 figures of the part number.

Since the introduction of this additional identification, the part number of an alternator can be ascertained even if the nameplate is missing or has become illegible. This makes it easier to find technical data in such cases, as well as to quote the full part number in correspondence or in guarantee claims.



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